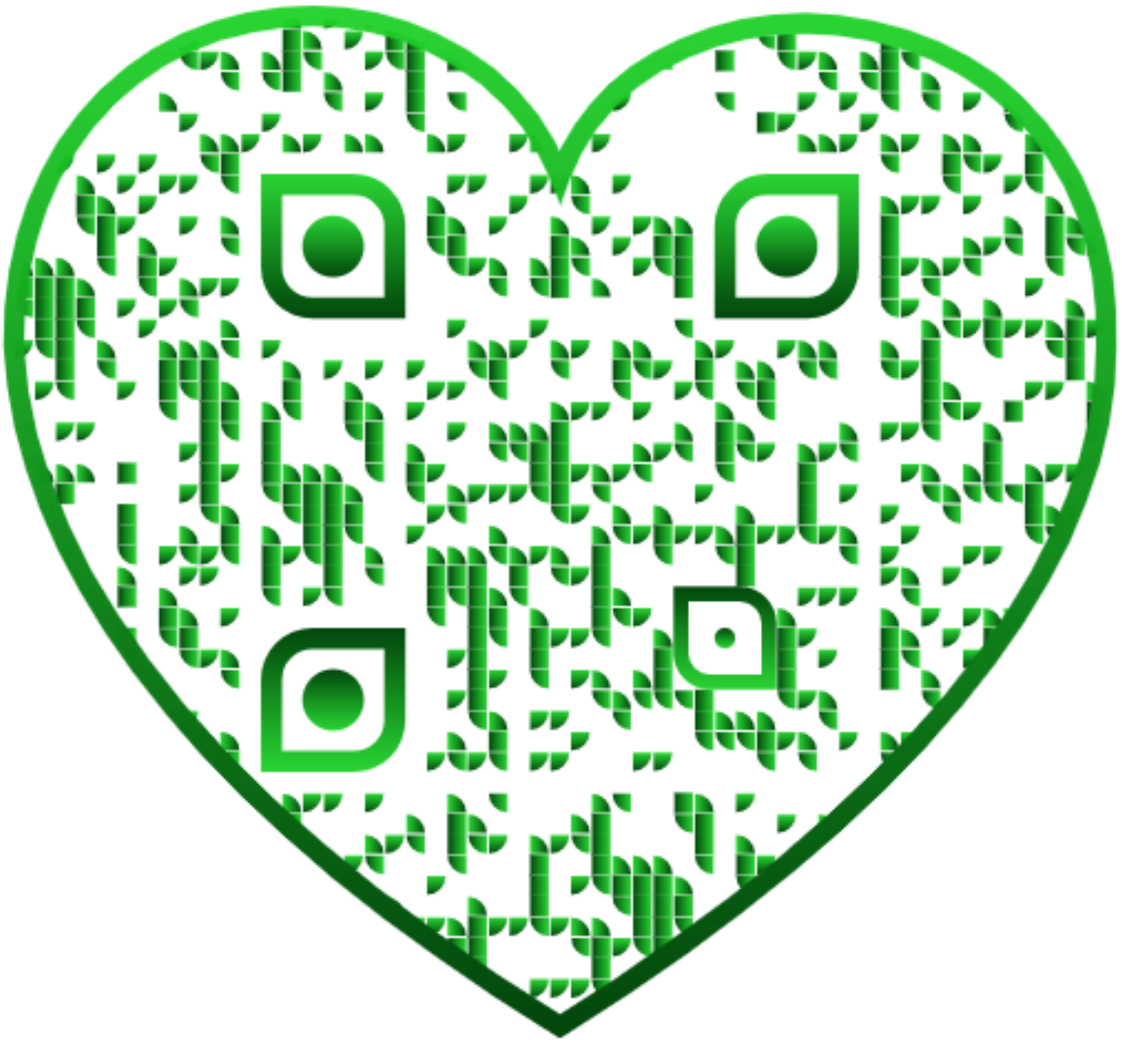
DEATH ON MARS

The Discovery of a Planetary Nuclear Massacre

John E. Brandenburg, Ph.D.



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Adventures Unlimited Press

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Prologue: The Outer Bridge

For now we see through a glass darkly, but someday, face to face.

The Apostle Paul: *1st Cor. 13: 25*

It is Thanksgiving Day when I begin to write this account of this great and terrible discovery of the age. On Thanksgiving Day we examine our lives and existence and give thanks to God and our fellow human beings for our many blessings, one of which is life itself.

Like the day on which I begin this tale, this book is actually a prayer, a prayer that humankind will realize how fortunate they are to have this Earth and each other and, in realizing their good fortune, will move forward to secure those fortunes. For beyond the fair circle of the Earth lies the abyss of space, and across that abyss lies the Red Planet, Mars. On Mars, as desolate as the Earth is rich in life, is a story carved and burned into its rocks, whose telling is both wondrous and terrifying. It is a tale of abundant life and catastrophic death, a tale of scientific discovery as epic as any seen in history, and a warning as astonishing as it is chilling.

My story begins in picturesque Albuquerque, set in the painted desert of the southwest in the icy depths of the Cold War, near one of the many 'ground-zeroes' of that conflict. There, I had assumed a job working on directed energy weapons at a great national research Laboratory, Sandia National Laboratories, named for the red hued Mountains to the east of Albuquerque. I was working in the nation's defense trying to perfect a new beam of destruction to rival the laser beam. I had always been a very patriotic individual, and my father and uncles were combat veterans of World War II. My father had survived the loss of three-quarters of the bomber squadron he flew with, but he would only ever attribute this fact to "dumb luck."[1] Accordingly, contributing to the nation's defense was second nature to me. But the Cold War, with its threat of mutual nuclear holocaust, seemed to me an intellectual nightmare, and I was on its intellectual front lines. I had been to Russia and toured it for two weeks as a college student. I had returned

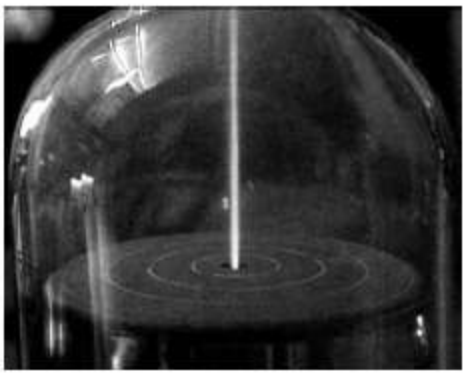
from there even more patriotic, but also with a deep love of the Russian land and people. Now the sight of Russian mothers weeping over their dead sons, killed in Afghanistan, on the news, filled me with deep sadness.

My father in World War II, who flew 25 combat missions in a B24 Bomber over Germany in WWII.

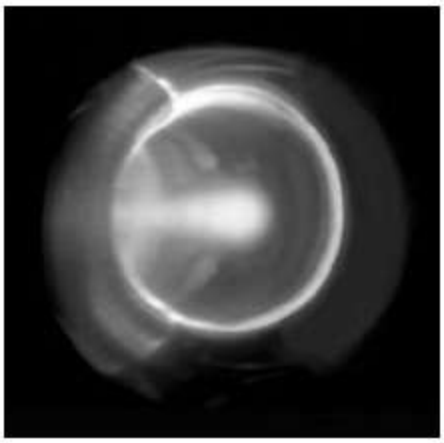
At Sandia we were trying to launch beams of high energy electrons through the air, a sort of directed lightning bolt. The electrons would come hurtling out of an accelerator, which happened to be of Russian design, and, in theory, were to fly straight toward a target at nearly the speed of light, strike it and deposit there energy all through it like x-rays, so that it would explode into white hot vapor. However, the powerful electron beams, like the lightning bolts that graced the skies over Albuquerque so abundantly, refused to fly straight. The electrons, like a flock of nervous sparrows, would dart this way and that, and end up flying in a random sinusoidal path, in defiance of any attempt to aim them precisely. The electrons were reacting dynamically to the electrically conducting plasma they created while boring a hole through the air. Plasma is the fourth state of matter, an electrically conducting glowing gas that makes up the stars, the aurora, the neon sign, the lightning, and 99% of the universe. The problem was that the plasma forming in the air around the electron beams, being an electrical conductor like polished metal, was creating a reflection or “image current” to the electron beam, and the

electron beam was being repelled by its own image. So the beams would penetrate the air, forming a plasma sheath around themselves, see their own reflection in it, and thrash around furiously trying to escape it. I had been hired by Sandia labs, in effect, to be a psychiatrist to the electrons, and teach them, if possible, not to be afraid of their own reflections. So they would fly straight and do their grim work on the targets we directed them to. Plasmas are what I was trained to work on as a scientist.

I had been trained to work on plasmas to solve the great problem facing humanity, the problem of energy. I completed my Doctoral Thesis on the problem of confining plasmas, hotter than the center of a star, so humanity could enjoy controlled fusion energy, a safer and cleaner form of nuclear power. That is, I and my colleagues had tried to bring the power of the stars to Earth. I had done my doctoral work under the brilliant Richard F. Post at another government research laboratory, Lawrence Livermore National Laboratory. We had made enormous progress on the problem of controlled fusion while I had been working there. However, with the change of administrations from Carter to Reagan had come a change in priorities. Controlled fusion research was to receive less funding. The icy flames of the Cold War were to be stoked instead. So my dreams of helping to ensure a bright warm future for humanity had been crushed as I had searched vainly for a job in controlled fusion in a time of tightening budgets. Instead, in order to fulfill my promise to my wife of a “good job, nice house, and affluence” after the privations of graduate school, I had taken a job in directed energy weapons research. It was a tough intellectual transition for me, but I had always tried to be tough. I was lucky to have gotten the job I had, but it came at a cost.



A electron beam in near vacuum



Plasma inside a Tokomak fusion magnetic confinement device

At Livermore, administered as part of the University of California, science had been conducted in a mostly academic manner, as far as I could tell, buried deep in the Magnetic fusion energy section. But I knew that at the other end of the vast laboratory, the physics and basic design of hydrogen bombs were being researched for the nation's arsenal. The graduate school I attended had the informal name of "Teller Tech", after its founder Edward Teller, a man I deeply respected. Teller had helped convince Einstein to sign a letter warning Franklin Roosevelt about the danger of Adolf Hitler gaining an atomic bomb ahead of the U.S. and Britain in World War II- a very real threat. Edward Teller had later invented the Hydrogen Bomb, staying just one step ahead of Andrei Sakharov, who was developing it for Joseph Stalin. So I was proud to be a graduate of his school.

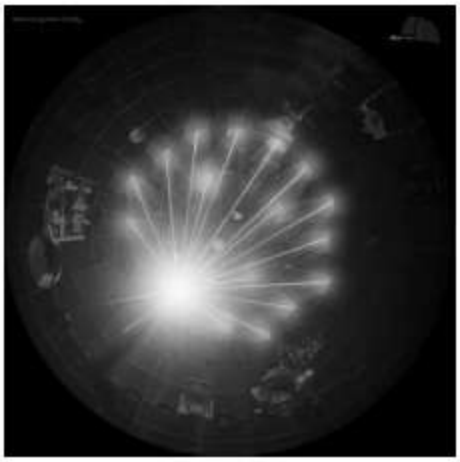
Edward Teller

Andrei Sakharov

American Hydrogen Bomb test

I had spent some time in the highly classified end of the Livermore laboratory working on Laser Fusion, which was an attempt to miniaturize the hydrogen bomb so its energy could be released in a series of controlled

micro-explosions. This effort required a great deal of knowledge gained from nuclear weapons design. I gained a basic knowledge of nuclear weapons design and operation at that time. The tenor of work in Laser Fusion was less academic and more results driven. The science was measured more in its impact on the world rather than being part of some vast quest for knowledge. My thesis advisor on that project, the brilliant Dr. Harry Sahlin, died tragically of heart failure during the period I was working for him, so I transferred back to the Magnetic Fusion end of the laboratory. Working on a new thesis in the more relaxed and scholarly magnetic fusion energy section, where fusion energy was to be released like a gentle gas flame, the Cold War had seemed more like an abstraction, and scientific inquiry was taken as an end in itself. All of that changed when I finished my doctorate and took a job at Sandia. Livermore Laboratory was a small college town devoted to science that would benefit humanity, Sandia Laboratory was then a desert fortress.



Many Laser beams focus in a Laser Fusion test

Sandia National Laboratories was a vast complex surrounded by a double security fence near the base of the russet mountains that gave it its name. It lay at the Southeast edge of beautiful Albuquerque and its southern expanse stretched off into the reddish colored high desert that surrounded Albuquerque. The Sandia Laboratory security fence was in turn surrounded by a security fence of the vast and sprawling Kirtland Air Force base, which also housed the Air Force Weapons Laboratory and Manzano Mountain

Nuclear Weapons Depot. Manzano Mountain was a hollowed out mountain far out in the desert to the south surrounded by a triple fence of gleaming razor wire, where it was rumored, thousands of nuclear weapons were stored. In case of a nuclear war, that nuclear weapons depot-it was said by my colleagues at Sandia-would attract probably a hundred Soviet Nuclear warheads from the sky and turn Manzano Mountain, Sandia Labs and Albuquerque into a vast glowing crater.

It is difficult to understand the mind-set of the times, especially the mind-set of those of us involved in national defense in those days of the early 1980's, when the Cold War raged in icy intensity. We have mostly forgotten those days, mercifully, when the nuclear extinction of the human race was always 30 minutes away. Sandia Laboratories was a more engineering oriented laboratory than Livermore and specialized primarily in the detailed engineering of building nuclear weapons and making sure they worked properly when deployed, that is, on doomsday. They wanted all of our bombs to function perfectly on that fateful day. 'No duds on doomsday' was the unofficial motto of Sandia Laboratories. They did their job well and professionally.

The Cold War: W. German and American Troops watch the East-West German Frontier

The Cold War, just an abstraction back in the magnetic fusion section at Livermore, roiled naked around me every morning at Sandia Laboratory as I arrived at work. The Cold War was a conflict between those who lived in freedom and those who did not, and having visited Russia as a college

student, I knew this well. The Cold War was also however, a vast Mexican standoff between the United States and its NATO Allies and the Soviet Union and its Warsaw Pact. Both bands of nations had nuclear guns drawn and pointed at each other, fingers on the triggers, and were exchanging curses. Everyone, especially in the defense field, knew that one noise mistaken for a gunshot, and everyone was going to start shooting nuclear missiles at each other. That life went on normally during those times was a triumph of the human capacity to "compartmentalize" problems such as the prospect of doomsday, from the everyday problems of a shopping list for the grocery store and finding the right route to work. In my case, my trip to work carried me by a bearded former employee at Sandia, who now stood outside the main gate and waved a sign that asked "Would Jesus work in this death factory?"

"Of course he wouldn't," joked one of my colleagues at lunch, "He couldn't get a security clearance."

Russian Tanks : The Warsaw Pact held huge advantages over NATO in conventional arms

My first year at Sandia National Laboratories, 1982, had gone well and I had achieved the good job, fine house and prosperous life that I had promised my wife. I remember walking in my backyard in the beautiful northeast heights of Albuquerque, watering dry areas in my nice green lawn with a garden hose in the summer twilight of 1983, and saying to God "my cup runneth over." I then remember praying a fateful prayer: I said,

"God, if you need a trained scientist for some task, I am your man"

Little did I realize then the glorious, epic and terrible task that God would set before me. Shortly afterwards, the shadow of Mars came to lie upon all of us, my family, my colleagues, and myself.

Mars, the Planet of War, the Red Planet, had been a source of fascination from ancient times when it figured large in royal astrological tables. Being the planet that foretold the fortunes of battle, kingdoms paid large sums to astrologers to track its movements carefully. One such royal astrologer was Tycho Brahe, who was aware of the new Copernican Model of the Universe. Copernicus had proposed, following the model of Aristarchus of Samos, a millennium before him, that the Sun and not the Earth was the center of the Universe. Copernicus had further proposed that the planets, including the Earth, moved in circles around the Sun. This had been a very unpopular view with the religious authorities and had gotten Copernicus's book a prominent place on the Catholic Church's list of banned books. Galileo, mastering the art of making glass lenses for telescopes, found proof of the basic Copernican Model and was placed under house arrest for the rest of his life for saying so. To disturb the Earth from the center of the Cosmos was to disturb the human race and its institutions of authority from the center of the Cosmos, an act of demotion the authorities did not appreciate. The same thing had happened to Aristarchus of Samos, except the angry priesthood of those days served Mars and Jupiter. Tycho Brahe, knowing where his bread was buttered, publically rejected the Copernican Model, while privately checking its accuracy. It was actually a good model, he told his assistant Johanne Kepler, except that the orbit of Mars was clearly not a precise circle centered on the Sun. With that fateful comment had begun the scientific revolution that would eventually produce nuclear weapons, rockets to deliver them to targets on Earth, and my job at Sandia Laboratories.

Mars, the God of War

Johanne Kepler

It all had begun with the orbit of Mars, which was clearly not a circle. Kepler, in studying the orbit of Mars, using Tycho Brahe's carefully recorded and highly accurate observations, found that Mars moved on an ellipse, a slightly oval circle, and worked out mathematically the laws of planetary motion. Later, Newton would seize upon Kepler's work to explain the elliptical orbit of Mars by his theory of gravitation, and in the process invent Newton's laws of motion, and calculus. Newton would publish this all in a book called ***The Principia Mathematica,*** and in doing so revolutionize the world and how it solved problems. Newton's laws of motion would lead to the work of Tsiolkovsky, who found the equation for rocket motion and

found that liquid fuels, with their light molecules, would be best for journeys into space.

Isacc Newton

Mars further beckoned humanity as the practice of science grew. A better understanding of optics enabled much better telescopes than those made by Galileo to be turned towards the Red Planet.

Percival Lowell

Mars had since become the scientific outer-bridge of the human realm, our slender connection with what was Earthlike in the rest of the cosmos. Through a glass darkly, brilliant Mars swam in a field of boiling Earthly atmospheric turbulence. Its white polar caps were easily visible, as were dust

storms in its windswept atmosphere. Mars demonstrated clearly an Earth-like planet apart from Earth and showed that other Earths probably existed around other stars. Perched high in the deserts around Flagstaff Arizona, with their clear skies, Percival Lowell's telescope with its great glass lenses probably had the best views of Mars of any telescope on Earth. In the moments when the atmosphere was quiet, thousands of subtle spidery details on Mars surface would become clearly visible, only to disappear when the Earth's atmosphere resumed its roiling movement. During those periods Percival Lowell would sketch what he saw, the human eyes being the best optical recording instrument available at the time. Tirelessly he worked all night, filling pads of paper with sketches during the "apparitions" of Mars, when the orbits of Mars and Earth brought them closest together. From these exhausting nights came material and maps, for books about Mars. Lowell, agreeing with other observers, thought he saw canals on Mars suggesting intelligent life and showed maps of them in his books. Many observers also recorded an apparent wave of darkening as the polar caps shrunk in the local summers on Mars, and this suggested a summer bloom of plant life on Mars. All of this together made Mars the stuff of dreams and an attractive destination for human explorers. But how to get there? That was the problem. However, others thought, perhaps, an inhabited Mars might present its own set of problems.

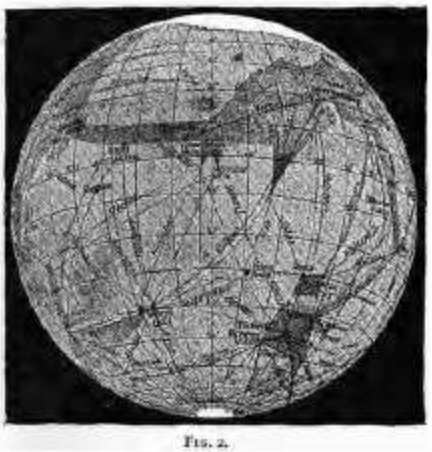


FIG. 2.

Percival Lowell's map of Mars, with polar caps and canals

In 1906, Mars became the source for the first extraterrestrial invasion of

Earth in H.G. Wells' ***War of the Worlds.*** In the brutal depiction of the Martian invasion of Victorian England, the Martian war machines overwhelmed the human military with laserlike heat rays and poison gas and utilized humans as a food source. However, this made Mars all the more fascinating to Robert Goddard, who read the book when he was 16 and at 17, while ascending a tall cherry tree to prune it, was overcome with inspiration. As he wrote:

> "On this day I climbed a tall cherry tree at the back of the barn…and as I looked toward the fields at the east, I imagined how wonderful it would be to make some device which had even the possibility of ascending to Mars, and how it would look on a small scale, if sent up from the meadow at my feet. I have several photographs of the tree, taken since, with the little ladder I made to climb it, leaning against it.
>
> It seemed to me then that a weight whirling around a horizontal shaft, moving more rapidly above than below, could furnish lift by virtue of the greater centrifugal force at the top of the path. I was a different boy when I descended the tree from when I ascended. Existence at last seemed very purposive."

Robert Goddard would go on to design, build and launch the first liquid fueled rocket. Later, as his rockets grew larger and traveled further, he decided in 1934, to move his rocket research to some out-of-the-way place where nothing ever happened: Roswell, New Mexico. There the modern rocket that would one day put satellites in orbit and send probes to Mars was born, and flew.

Robert Goddard

One of Goddard's rockets at Roswell, New Mexico

That Mars was an abode of life, like Earth, had become a widely accepted idea. But all that was to change when the first space probes, the products of the scientific revolution inspired by Mars, reached the planet and imaged it at close range and without the turbulent atmosphere of Earth in the way.

The Mars that the robotic eyes of Marnier 4 saw was a desolate wasteland, a cratered Moon-like orb. To the eyes of humanity, locked deeply in the Cold War- a war that could flash to nuclear heat at any time- the Mars they beheld was the Earth of their worst fears. It was a Mars that looked like Earth would look long after a nuclear war had wiped out humanity. Mars had become the outer-bridge of humanity to the stars, but it showed us, rather than hope, a glimpse of our possible fate. So it was that Mars had been the specter of war to the ancients, then the spark of the scientific revolution, then the father of the rocket that could bridge the abyss between Mars and Earth, and now, a

dark vision of our future.

Titan Rocket, both ICBM and space launcher

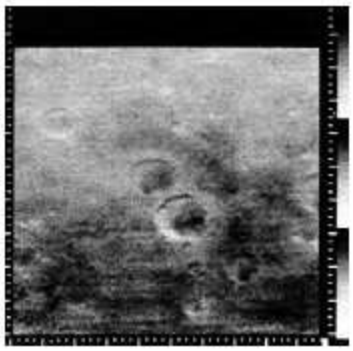
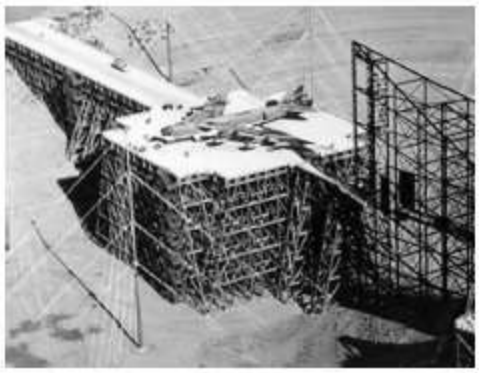


Image of Mars surface from Mariner 4

But the rocket could also carry nuclear warheads to any place on Earth, and hence my job at Sandia, in the Temple of Mars. I was deep now inside the perimeter of Kirtland Air Force base, where every morning jet fighters of the New Mexico Air National Guard would take off right over the building where I worked. They would fly south to weapons ranges in White Sands to practice strafing and rocket and bombing drills on targets in the Mars-like desert. It was said that should the long-feared NATO-Warsaw Pact war breakout in Europe, they would be the first National Guard units to be sent from the US, so they practiced constantly.

Outside, at a nearby facility called the “Trestle,” the electromagnetic pulse produced by nuclear weapon explosions was simulated and every conceivable piece of US or allied military equipment, from tanks to ambulances, was

tested to see if they would still function after a nuclear attack.



The Trestle Simulated nuclear EMP test facility at Sandia

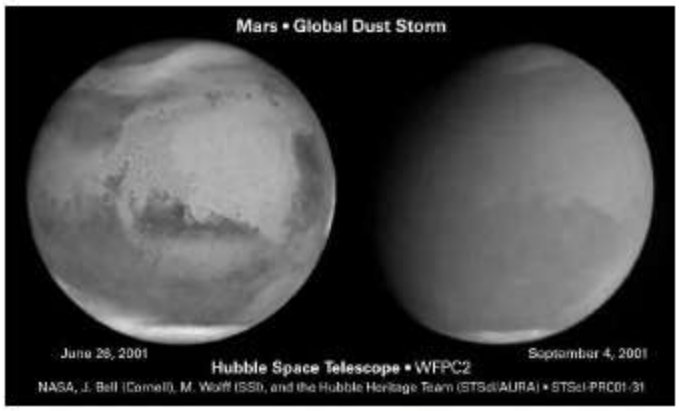
Another area of the simulated nuclear EMP test facility

I joked that soon they would test racks of bayonets to make sure even they could function after a nuclear attack and continue the war after even its last bullets were spent. This was all the perfection of MAD (Mutual Assured Destruction), which relied on the assurance that we would respond in kind to any nuclear attack, even if it meant everything we cared about was burned to ashes. To be perfect, our madness had to be absolutely convincing.

While I had long ago decided that I did not want to survive a nuclear war, others in the military and at Sandia were dutifully working to make sure that military equipment would still function, to continue the war long after most of the human race was dead. I was to find out that many of my colleagues at

Sandia, fellow physicists and engineers, differed from me in that they preserved a hope they could survive a nuclear war with their families. I was to find out that this forlorn hope existed when news from the desolate planet Mars extinguished this hope utterly.

In the fall of 1983, the shadow of a dust storm on Mars in 1971 cast a pall over Sandia Laboratories and all who worked there. In 1971, when the Mariner 9 spacecraft had reached Mars and begun orbiting it, a dust storm of global size had broken out and covered the planet from pole to pole for months. Analysis had later shown that the dust in the Mars atmosphere had blocked all sunlight from the Martian surface so that it had frozen solid, while the upper atmosphere had been warmed by sunlight striking the dust and warming the air around it, driving winds that kept the dust suspended for months. In 1982 a team of scientists Turco, Toon, Ackerman, Pollack, and Sagan, a collaboration aptly abbreviated TTAPS from their initials, had found that the same mechanism that had caused the Mars global dust storm could occur on Earth, following a nuclear war.[2] The effects of such a global dust layer would be to cause a “Nuclear Winter” similar in effect to the 1815 eruption of Mount Tambora in Indonesia that caused the “year without summer” and many deaths due to cold and starvation in Europe. This meant that many more people would die of cold and starvation after the initial massacre of a nuclear war as from the explosions and fallout during it. Similar conclusions had been reached by scientists in the Soviet Union during the same time period. Publication of this result in early December 1983 caused a deep depression to fall on many of those I worked with. Compartmentalization of our thoughts failed us.


Mars • Global Dust Storm
June 26, 2001
September 4, 2001
Hubble Space Telescope • WFPC2
NASA, J. Bell (Cornell), M. Wolff (SSI), and the Hubble Heritage Team (STScI/AURA) • STScI-PRC01-31

Mars wreathed in a global dust storm

"I used to think I would run home and get my wife and kids into the car and head for the hills if a nuclear war started. Now I'd just take them all down for a picnic in Rio Grande Park here in Albuquerque." said one scientist to me over lunch, with a far-away look in his eyes. My office-mate, Malcolm, normally a happy-go-lucky character, said pretty much the same thing one day, but instead of picnic for his family, he proposed climbing onto the roof of his house with a six-pack of beer, 'to watch the whole thing go.' I responded by asking him helplessly "what brand of beer would you be drinking that day, Malcolm?"

I had always wanted to write science fiction since I was young. In Albuquerque at that time, I was seized by a desire to write a story about a Mars colony in the future, a positive concept where the human race had somehow survived the Cold War without a nuclear holocaust. I was inspired to think about Mars because of the red mountains, deserts, and arroyos of Albuquerque. Christmas drew near, so I began to read up about the scientific data gathered by the Viking mission to Mars several years earlier. I wanted my depiction of Mars to be accurate. My desire to write science fiction had begun in my childhood.

One story I had begun one summer, when I was fourteen, concerned a captain of a small patrol ship in a quiet sector of an interstellar war. He was named Garcia in the story, in my personal bow to the diversity I had seen on ***Star Trek.*** I had been inspired by the story of Captain Outerbridge of the destroyer USS Ward, a first-time Captain on his first patrol, who had spotted

what he thought was a midget submarine trying to sneak into the mouth of Pearl Harbor near the surface. In response, he had brought his ship to battle stations, brought the ship around to face the submarine, attacked it with gunfire and depth charges and sank it. Since no trace of the submarine could be found after his attack, however, the actions of Outerbridge were dismissed on-shore that morning as the nervous act of a “rookie skipper” on his first patrol. However, this had all happened early on the beautiful Sunday morning of December 7 1941, and the air attack on Pearl Harbor had begun a few hours later. Several midget submarines did, in fact, make it into Pearl Harbor that day.

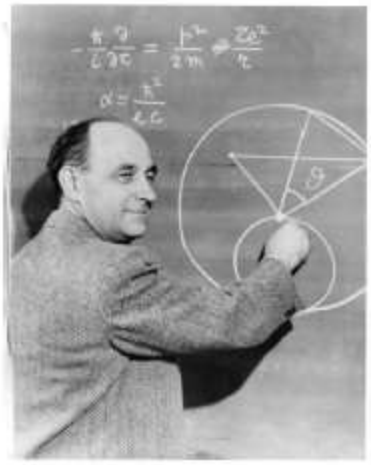
The U.S.S. Ward

In the science fiction story my fevered fourteen-year old mind had concocted from this piece of history, the enemy the humans were fighting in the interstellar was very much like us in appearance, but behaved in a manner that seemed to humans as very irrational and unpredictable. In the story, the captain spotted what he believed to be a carved human face on the side of an asteroid passing near his ship. Despite the rest of the crews doubting his sanity, he ordered his ship to abruptly change orbit. This action saved his ship and later the whole human race, when the asteroid is found to be a nuclear space mine and exploded. The space mine was found to be the first precursor to a movement by a hostile alien fleet hoping to stage a sneak attack through the obscure star system that Capitan Garcia’s ship had patrolled. The lonely patrol ship had been its intended target. The motive for the aliens carving a human face on the side of a space mine, a space mine crucial to their sneak attack, was due to their innate irrationality. It was the alien’s way of ‘counting coup’ like the Native Americans. It was a taunting gesture towards

the humans. Looking back on it, I think my fourteen-year old mind was trying to digest the madness of the Cold War. This story had appeared to me vividly back then on summer vacation and I had outlined the whole plot and written roughly 100 pages of it before school started and had to abandon the project.

I had imagined aliens who looked and acted like us. Had I seen aliens unlike us I might have used them as a model in my science fiction. My plot device was roughly in keeping with the scientific principal of “Mediocrity.” This concept, that humans are typical of intelligent life in the cosmos, that we were “average” rather than being exotic, is a principle underlying all searches for extraterrestrial intelligence.[3] However, no aliens in outer space were known. I was merely guessing. The stars around us were silent. Even this silence was ominous, given the troubles of the age I lived in. This silence was known as Fermi’s Paradox: the perceived emptiness of the universe, when logic suggested it should be a noisy place full of civilizations such as ourselves.

Enrico Fermi had discovered this paradox while working on the Hydrogen Bomb in 1950 at Los Alamos in New Mexico. He had been having lunch with Edward Teller and some other scientists, and their conversations had turned to extraterrestrial life and space travel. This was a luncheon conversation of men who had fled the Holocaust and beaten Hitler’s best scientists in a race to build the first atomic bomb during the most savage and destructive war the world had ever seen. They had seen it light the desert night ‘brighter than a thousand suns’ and turn its sand to glass. They had then seen it dropped on Hiroshima and Nagasaki in order to end the war. They were now racing the Russians to build the Hydrogen Bomb, a weapon a thousand times more powerful, so that Joseph Stalin would not have it first. They would succeed only by months. The men at this lunch table probably combined more sheer intelligence and mental toughness than any group on Earth. To say they were ‘out of the box’ thinkers was an understatement; for these men, there was “no box.”



Enrico Fermi

Typically, Fermi had quickly analyzed the problem of the universe where intelligent life was both possible and noisy. Fermi had noted that Earth and the human race seemed rather random and poorly behaved, yet we were thriving and putting out lots of radio noise. He assumed Mediocrity. He thought planets like Earth and life should be found elsewhere, and evolution would occur elsewhere like on Earth. He also knew the Universe was very old compared to humanity. There was plenty of time for other species to develop and make radio and TV broadcasts and perhaps even travel here in spaceships. By all logic, we should be confronting a cosmos full of life and vibrant civilizations like ourselves. It must be understood that scientists working in national defense think differently than those in academia and find different critical paths of logic. Whereas academics often think in terms of probabilities of events, scientists in defense often think in terms of risks, which is the product between a probability of an event and its effect. Thus, probability-based thinking often gives answers as a percentage, whereas risk-based thinking often gives answers in human lives. Both methods have their virtues.

"Where the hell are they?" exclaimed Fermi suddenly at the lunch table.[4] Everyone at the table knew who he referred to. It was the ETs (extra-terrestrials), but no one at the table could answer his question. Why did the universe seem empty and silent when logic suggested it should be noisy with music, soap commercials, and political propaganda? Was some force present

that destroyed civilizations once they reached the point where, like ourselves, their radio and television broadcasts would proclaim their existence to the stars? Did this mean civilizations all destroyed themselves with nuclear weapons once they reached a certain age? Sagan had suggested this terrible possibility in his book ***Cosmos.***[5] Was this what the silence of the stars meant? Were the stars telling us, by their silence, that we were doomed? I wasted little time pondering this question, but it always lurked in the back of my mind in those days.

Carl Sagan

My mother and father had visited me earlier in the year of 1983 and I had spoken to them of my renewed desire to write science fiction. I wanted to write about a human future in the stars. I spoke of wanting to write a novel where the biggest discovery the human race would make was that the universe was mostly peopled by other human beings. I interpreted these desires as hopeful signs for the future and evidence of my own good mental health during the stress of working at Sandia.

During their visit, I had taken my parents on a tour of Sandia, going far out into the desert on a rainy day to show them a big solar power tower experiment. On the way back towards town we had encountered a military roadblock, clearing the rainy highway for a massive military convoy of camouflaged trucks, guarded by soldiers in combat gear carrying M-16s, and armored cars sprouting machine guns. The trucks slowly towed flatbed trailers carrying oblong objects under blue tarpaulins. The whole convoy of perhaps ten trucks was winding its way into the entrance in the side of

Manzano mountain under a gray sky. As one of the trucks passed us, the wind caught a loose rain-slick tarpaulin and blew it to one side exposing a nuclear bomb, complete with tailfins, on the back of the truck as it rolled slowly past. I remember the sight chilled me to the core, and I asked my parents to pray with me before they left because I said, “I am working in a fearful place.” Shortly after my parents had left, things started going south at work.

I had been a rather sensitive child growing up. I had been dyslexic and uncoordinated in pre-adolescence, and was thus a victim of much bullying. “I’ll knock you to Mars!” was the memorable threat of one neighborhood bully as he waved his fist in front of my face. I had striven to become more coordinated and tougher in mind and body as I became a teenager and I came to view life as conflict. I had gotten into two brawls in high school by asserting my new strength and confidence. But, I also had always been religious, and when my parents decided to join a charismatic, or neo-Pentecostal church, while I was in college, I had followed them. There I received the baptism in the Holy Spirit, which changed my life, making me more confident and more perceptive; for instance, I started winning at poker - these were friendly games of course. Also, things that would be considered as psychic phenomena in the secular world became everyday occurrences for me. I became very intuitive. However, one of the chief effects of this experience was to make me feel that my life was to be lived for purposes beyond myself and that I must seek to fulfill God’s plans for my life, rather than my own.

Despite the sensibilities of being religious I took great comfort from my faith as the Nuclear Winter and mounting trouble at work swirled around me. It was my first job out of graduate school, and I was finding the conditions at work as harsh as the desert around me. I made many mistakes and my brash confident manner had offended some people at work. I had also preserved my interest in magnetic fusion, and gotten caught on the wrong side of a management dispute regarding it. More importantly, despite my good relations with my fellow scientists at work I had also gotten involved in a scientific dispute with a senior scientist on the electron beam project that I worked on. This dispute had turned bitter and, despite my best efforts to defuse it, became increasingly personal.

We were researching how to prevent the electron beams from being repelled from their own electronic image in the plasma channel they created in the air. This was called the fire-hose instability because it resembled the action of a loose, high-pressure fire-hose thrashing around. The electron beam would carve a lightning bolt through the air as sort of a sheath around itself and then try to thrash its way violently out of it. It was like a panic stricken animal afraid of its own image, lost in a hall of mirrors and trying desperately to escape. I had proposed that if the beams spun, like a rifled bullet, this would calm the instability. The allegorical animal would see a smooth smeared out image of itself all around and thus be calmer. But I had unwittingly contradicted the senior scientist on the project when I proposed this idea. I was the flamboyant young scientist eager to prove himself; he was the old senior scientist, seeking to maintain his reputation of brilliance. Before I knew it, we were deep in a theoretical dispute, neither side budging. The situation was not helped by my immediate supervisor, who seemed strangely remote and detached when I would try to explain this trouble to him. He had a famously “poker faced” expression, and would simply present it to me when I would come to his office and complain about my treatment, until I would lapse into embarrassed silence, mutter an apology for being a “whiner” and leave.

So it was at Sandia Laboratory when December 1983 slipped away, finding me confused and frightened by the situation at work, deeply concerned about the Cold War I was part of, and haunted, like my fellows at work, by the shadow of Mars. This was the same Mars that had given rise to the science I cherished, a Mars colored like the mountains and desert surrounding me. This was the same Mars that was giving me the comforting thought of a human race safe and sound in the future, living in colonies on its surface. So I was prepared for my collision with that thing on Mars that would change everything.

Christmas came in 1983. I remember singing the beautiful hymn *“Oh Little Town Of Bethlehem’”* in church with my lovely wife and beautiful 3 year old daughter, Elizabeth.

O little town of Bethlehem,

how still we see thee lie;

above thy deep and dreamless sleep
the silent stars go by.
Yet in thy dark streets shineth
the everlasting light;
the hopes and fears of all the years
are met in thee tonight.

But I thought, as I sang that hymn, what had happened to Bethlehem and its young children, afterwards? Herod's troops had massacred them. That Christmas I was facing the failure of mental compartmentalization, the compartmentalization that was essential if I was to function at work or anywhere else.

Herod's troops slaughter the male infants in Bethlehem

So that Christmas I was struggling to adjust to my new life and new job, under the shadow of Mars, and under the silent stars, when my offer to God came due.

My wife and I in Albuquerque

The silent stars

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Chapter 1 The Day after Christmas

It was on the day after Christmas that I first beheld that thing of another world which, for me, was so full of meaning and portent.

I had enjoyed a wonderful Christmas with my lovely wife and young daughter, Elizabeth. My wife of ten years had been very concerned about the human cost of the Cold War and had been working with our church to help refugees from wars raging in Central America. She is part Native-American and thus has a different view of American history than I, but this had not been an issue before. Now, she was uneasy with my job in the military industrial complex, but was doing the best she could, being more liberal than I. We had married young, as was the habit in Oregon, where we grew up. We had married when I had just finished college, and she had finished her first year. She was now finishing her degree at the University of New Mexico in Albuquerque. One marries one person, but lives with what that person becomes.

In our comfortable house overlooking picturesque Albuquerque, near a large arroyo, or dry river bed only occasionally filled with water, night was settling and wisps of snow were blowing around the house. We were waiting for an evening magazine program about Mars. I had seen it advertised earlier in the afternoon and I was delighted. I had expected some nice color pictures of Mars' surface. I was looking for an escape.

Pursuing my dream of writing science fiction about a living human future, I had been reading about Mars voraciously, principally in the book ***Cosmos,*** by Carl Sagan. Despite Mars' reputation as a barren and moonlike world, Sagan had pointed out evidence for dried river channels (arroyos) indicating a brief period of Earthlike climate in the distant past. The narrow range of atmospheric pressure and temperatures that allowed water to exist in a liquid state basically defines an Earthly environment. More than that, all known living processes required liquid water, so its absence on Mars was considered the death sentence for any biology on the Red Planet. As I read, I discovered that many of these dried river beds had been discovered by Mariner 9 in the

1971-72 timeframe. The 1976 Viking missions, which had 2 large orbiters, each carrying a lander, had targeted their landers into regions that looked to Mariner 9's cameras as though liquid water had flowed abundantly in the past.

The Viking missions had been planned around testing the soil on Mars for life. Many scientists at JPL (Jet Propulsion Laboratory) had been surprisingly critical of the whole concept, saying it was 'fool's errand.' I heard one such man speak at Lawrence Livermore National Laboratory in the weeks before the Viking Landing while I was a graduate student there. He had said "the Viking life experiments had more to do with the Mars of Lowell than any modern Mars science." Mars, he had said, was surely as dead as the Moon and had always been dead. He predicted the Viking lander experiments would find no evidence of life. I remember finding this attitude very annoying and prejudiced.

If there was one thing I had learned about scientific experiments at Livermore, it was that attitude in a difficult experiment was crucial. If you did not believe in the effect you were trying to see, you probably would not find it. I had seen many experiments fail, and few succeed, in my time as a graduate student at Livermore Lab. The one thing I had noted during that time was that a negative attitude almost guaranteed failure in an experiment. But despite this man from JPL's negative attitude, I had accepted the man's scientific arguments for a dead Mars and not been surprised when the official verdict was handed down months later, after the successful landings, that Mars was a dead world. I was even a little relieved.

Like many who were religious, I had been uneasy about the idea of extraterrestrial life, having been told from the pulpit that it contradicted the Bible. However, I had gotten through that spiritual crisis in 1976, and I had matured and grown more bold since then. I had done a thorough study of the Bible in the ancient Greek, the original language of the New Testament, and I had had found that the Bible actually strongly implied life and intelligence elsewhere in the Cosmos. For instance, when Jesus tell his disciples to "go into all the world and preach the gospel to every creature," it does not imply in the Greek that these creatures are necessarily human. This verse was interpreted by Saint Francis of Assisi that he should preach even to the

animals of the forest. But most profoundly, the word translated as “world” in this verse in the King James Bible is actually the Greek word “kosmos”, the same Greek word invented by the Greek Philosopher Pythagoras to describe the entire universe. Thus Jesus had told his disciples to go out into the entire universe and preach to whoever would listen. This would not be a fool’s errand, I knew. But I was not thinking about all that then, on the evening after Christmas in Albuquerque.

My mood was one of levity as I waited for the Evening Magazine to start, like waiting for an episode of ***Flash Gordon’s Trip to Mars*** to begin. The advertisement had said something about a “Face on Mars” and I expected something ludicrous like an eggplant that looked like Richard Nixon. So there I was sitting on the day after Christmas, resting from my struggles at work, surrounded with my loving family, sipping coffee, eating nachos my wife had prepared, and looking forward to some light entertainment. The program started.

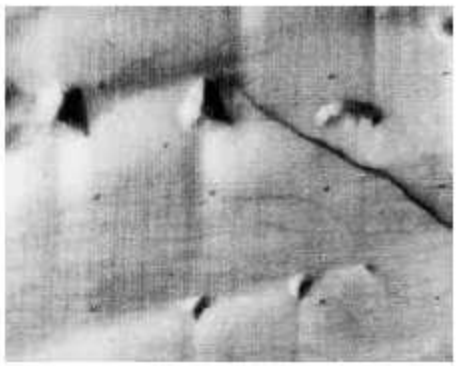
Flash Gordon’s Trip to Mars

The smile vanished from my face as I beheld the two images of the face on Mars, found and enhanced by Vincent DiPietro and Greg Molenaar, two electrical engineers working at NASA Goddard. This was not an eggplant that looked like Richard Nixon. It appeared clearly like archeology, a carved head in a helmet. I was struck with astonishment, I remembered the dried river beds of Mars, evidence of past terrestrial conditions, but the Face implied something far more than a few arroyos on Mars. It reminded me of carvings I had seen in Museums in Old Mexico when my wife and I had

visited there years before. The Olmecs had carved similar large faces, framed by helmets. I also remembered reading about the pyramids of Elysium on Mars in the book ***Cosmos.*** [1]

The face on Mars from the Viking discovery image 35A72 (left)and in frame 70A13(right) (images by Carlotto)

I remembered having read of and seen a picture of the Pyramids of Elysium in the book ***Cosmos*** with slight annoyance, a few days before. Sagan had said they 'warranted a careful look.' This annoyed me because they spoiled the otherwise perfect view of Mars as a barren Moonlike world, forever devoid of life. This concept of a Moon-like planet had been the basic message of Sagan's chapter on Mars, but why then include a picture of what looked like pyramids? Still, I connected the pyramids with the image of the Face on Mars, now seared into my mind. Together they suggested prior habitation of Mars, but how was that possible? Could it be that the whole Mars science community had misread the riddle of Mars completely? Intensely curious, I burned the names DiPietro, Molenaar and Goddard Space Flight Center into my brain and resolved to contact them after the Christmas holidays. I was used to being on the cutting edge of science. The idea that I should simply ignore this possible breakthrough was unthinkable. I was determined to learn more.

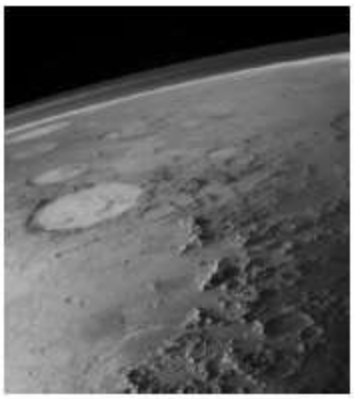


Pyramids of Elysium , image taken by Mariner 9

The scientific posture towards Mars and its bio-history had been largely determined by the data from the epic Viking Expeditions of 1976.

As I related in my other book ***Life and Death on Mars: The New Mars Synthesis:***[2]

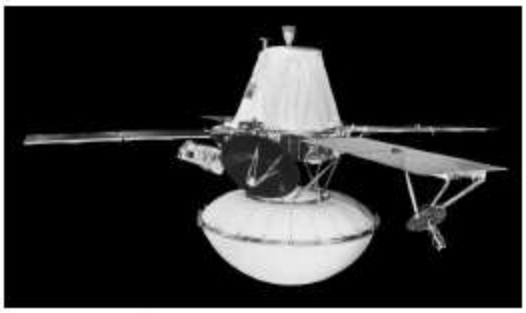
> "To address the life question, the Viking probes were sent to Mars and arrived in July 1976. The Vikings were meant to display not only the technological prowess of the United States; they were to be part of its bicentennial celebration as well. The Soviets had by this time given up on Mars, and were concentrating on Venus, a closer and easier target where they could control the mission in real time. The Viking probes, A and B, representing the skill of NASA's Jet Propulsion Laboratory at its height, assumed orbit around Mars. The Viking probes were composed of two parts, an orbiter to take images and perform other remote measurements from orbit, and a nuclear-powered lander to set up a scientific station on the surface to measure Mars's atmosphere and its soil properties. The other purpose of the landers was to bring samples of the soil into a miniature biology laboratory. There, using ingeniously designed mechanisms, the soil samples would be tested to see if any living organisms resided inside them.



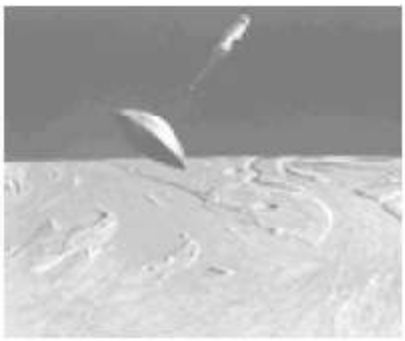
The Vikings see Mars. (JPL/NASA)

Former islands in a Mars flood (JPL/NASA)

A whiff of danger surrounded this Viking mission. Not only was it costly (several billion dollars) but Russian surface probes had crashed while attempting to land on Mars, so the planet was fully capable of destroying these probes as well, if the mission controllers were not very careful. Thus the spacecraft assumed orbit and imaged the candidate landing sites at much higher resolution than Mariner 9 to ensure their safety. Only after certifying the safety of the landing sites by images and radar from Earth, did the orbiting spacecraft release the nuclear-powered landing craft.



One of the two Viking spacecraft carrying a lander (JPL/NASA)



Descent of the Viking Mars lander (JPL/NASA)

However, the danger ran deeper than just a landing mishap. Suppose the lander experiments found life? What then? Would this not provoke a spiritual crisis within humanity, when it realized it was not God's only and most beloved child? We could accept that we were not at the geometric center of the universe. We had dealt with that metaphysical crisis and moved on. Now we knew the universe had no center, so that geometric demotion did not matter anyway. But we were the center of the biological universe and the top of the food chain to boot. If they found life on Mars we would truly be demoted from owning the only oasis in a huge desert to being microbes clinging to a speck of dust. If the Mars life experiments were positive, would this not mean some of the stars were looking back? Were they looking at us, as Wells had suggested, with envious eyes? Would a positive result of the life experiments mean panic in the streets as in 1938?

More urgently, perhaps, would a positive life sign not provoke troublesome questions to the government? Questions like: what are those

lights in the sky at night?

The lunar Mars model people, however, knew better than to be apprehensive about the life experiments. They faced the experiments with calm confidence: the life experiments would be negative. They would be negative because Mars was dead as a doornail. In fact, in their opinion, the Viking life experiments were a shameful waste of payload space on the landers. Even testing for life was a chore that had nothing to do with modern Mars science. They knew this with every fiber of their being. They were instead looking forward to the mineral and atmospheric results of the lander probes of the surface. They also waited with anticipation for the Viking images from orbit, in far greater detail than Mariner 9, and in color.

The images of the Viking orbiters verified and expanded upon the profound wonders found by Mariner 9. The channels were everywhere, mingling with craters and emptying into and from them, as if the craters had been lakes full of water. The walls of the Vallis Marineris were found to be made of sedimentary layers that ran continuously for hundreds of miles, suggesting immediately that the layers had been laid down in a huge lake or sea, as had been similar sedimentary beds on Earth. The tops of the volcanoes were fresh and free of craters, suggesting that the volcanoes had been recently active. The water channels ran across the cratered highlands and then abruptly ended at the edge of the low plains. Some terrains on Mars had so few craters that they looked terrestrial. On some of these nearly terrestrial terrains dried water channels ran sinuously. On others, exposed cliffs revealed millions of parallel layers stretching down for kilometers into vast chasms. To the terrestrial geologist, the message of these images was unmistakable: water in massive amounts had moved and sat in lakes on Mars surface for eons, almost until the present.

The Viking A lands on Mars (JPL/NASA)

A Viking lander (JPL/NASA)

The summits of the massive volcanoes were imaged in great detail revealing that the volcanoes had erupted recently in geologic times. Mars was obviously a planet that had known a rich full life of every sort of geologic activity known on Earth and this geologic dynamism had continued until recent times.

The determination that some areas of lava flows and water activity were recent had to be made by inspection from afar, at the time the meteorites from Mars were sitting in museums unrecognized. Since they had no known Mars rocks to test for radioactive ages, the Mars scientists were counting craters.

Space is a realm of extremes, of hot and cold and also relative velocities. Under our atmosphere on Earth, things can move fast by human reckoning, as fast as the wind, as fast as sound. However, to move faster than sound, a few hundred meters a second, requires high levels of power. This happens because the air can no longer simply step aside and let you pass by. It piles up in front of you and makes shockwaves and high levels of heat. To go supersonic requires enormous engines; to go hypersonic, many times the

speed of sound, requires a large rocket engine. In order to achieve orbital velocity a satellite must be boosted to hypersonic velocities. To stay in orbit at this velocity, it must be above the atmosphere, in the vacuum of space.

Gravity scoops up all the gas in space and piles it up as atmospheres on the surface of planets, but beyond the tops of those atmospheres exists a vacuum of the most extreme purity. In that vacuum, things move effortlessly and without power being required. What objects moving in space do is contain power. Planets, moons, and everything else moves in the vacuum of space like a vast well-designed machine without friction; that is, until something collides with something else. With nothing to slow down objects relative to each other, these occasional collisions occur at hypersonic velocities. On impact the smaller of the objects will turn instantly into blue-white-hot vapor and create an explosion of energy many times that from an equal mass of TNT. For objects of even everyday size coming in from space and not being burned up in Earth's atmosphere, the results dwarf human experience. The Beranger meteor crater in Arizona, for instance, was caused by the impact of a mass of nickel-iron alloy the size of a semi-truck. The Earth is full of such craters, but only the most geologically recent ones show themselves clearly; the older craters have been eroded away by water, wind, and lava. To see what the Earth would look like without these erosive processes at work, one need only look at the full Moon.

The Moon was where the methods to relate ages of terrains to the number of craters they contained were worked out. The Apollo astronauts had gone to the Moon six times by 1976, and had brought back nearly a ton of rocks from its surface. The rock samples had been gathered at several carefully selected sites of the lunar surface. The rocks had been carefully selected by the astronauts and documented as to where they had been found. The ages of the rocks had been determined by radiometric methods back on Earth, where it was found that the average ages of rocks from each site could be correlated with the number of craters above a certain size per square kilometer of the terrain at the site. These methods found that the rocks from the rugged highlands of the Moon, the most ancient of the moon rocks, were 4.5 eons in age. These rocks were older than any found on Earth, and dated from the foundation of the solar system. The lunar highlands, where they were found, are areas with very heavy cratering. This heavy crater pattern had a very

chaotic set of statistics, meaning objects of a wide variety of sizes had crashed at equal rates into the lunar surface. Younger rocks from the Moon, however, dating from 4.0 eon's age to 2.0 eons, were found in the dark smooth areas of the Moon, the Maria, which had been flooded with lava.

The lunar Maria, such as Oceanus Procellarum, the Ocean of Storms, showed a much different pattern of crater statistics than the Highlands. Instead of reflecting the primordial chaos of the foundation of the solar system, the pattern of size distribution versus number per square kilometer showed an orderly statistical pattern with small craters being more frequent than large ones. The logarithmic progression of these crater statistics on the Moon indicated that, once things in the solar system had gotten settled down, cratering proceeded at a fairly uniform rate of the eons, with the same distribution of sizes of impacts eon after eon. This was very useful, because if the rate was the same over the eons, you could count craters from orbit, check ages of corresponding rocks on the Moon, and thus estimate the ages of the terrains that the craters occupied.

Ages on the Moon meant not the actual age of the surface, but the age since the last episode of lava flows or the last nearby giant impact had covered the surface with debris and rendered it smooth and free of craters. Therefore, the Apollo missions had given humanity a new tool for measurement, a book listing crater numbers per square kilometer above a certain size where also rocks of so many eons had been gathered. By extrapolating these correlations of rock-sample radiometric ages to crater counts scientists could estimate a rate at which craters above certain size formed on Earth or other nearby planets. This meant you could estimate geologic ages of landscapes on the Moon by taking images and counting craters on the landscape.

This lunar crater-chronology method was immediately applied to Mars. This was done despite the fact that Mars was closer to the asteroid belt and should have a higher rate of cratering. Not surprisingly, the ages found on Mars were lunar, and for a brief moment, the Mars-is-like-the-Moon party rejoiced. They argued that the signs of liquid water in Mars's past must date from some early period during the intense bombardment when blocks of ice were melted under the Martian surface and water would flow for a short

period before freezing and being lost to space. After this chaotic period, the lunar Mars party advocated, Mars had settled quickly into a comfortable lunar quiescence. However, numerous problems for the lunar-Mars advocates surfaced in the new Viking images.

The new images of Viking were crisp, startling, and covered large amounts of the planet's surface in great detail. In the end it would take 50,000 images covering the whole planet's surface. The images showed objects easily thirty meters across, and sometimes 10 meters across. They showed water channels on terrain with few craters, as well as great floods emerging from chaotic broken terrain that rushed apparently headlong into the smooth plains and then disappeared. They showed networks of small channels feeding into larger ones like a rain-fed watershed network found on Earth. On the flanks of volcanoes, the images captured patterns of drainage channels nearly identical to those found on similar volcanoes in Hawaii. The images showed great fields of sand dunes surrounding the northern polar cap that looked like those on Earth. This led to an important question: Was the rate of cratering on Mars the same as on the Moon? The answer lies in the construction of the Solar System.

In the Solar System, the inner planets close to the Sun are small, rocky, and with distinct surfaces. Mars marks the farthest outpost of this inner solar system from the Sun. Beginning at Jupiter, the next planet outwards, the planets are large, gaseous, and with no solid surface. In the no-man's land between these two realms of the Solar System, between the orbits of Mars and Jupiter, lies the asteroid belt, a disk of circulating rocks ranging from pebbles to Moon-like Ceres with a diameter of 500 kilometers. No large planet formed there, or possibly two formed and shattered each other in a collision. In any case the gravity of Jupiter constantly stirs the asteroid belt, frightening them into rings separated by the Kirkwood gaps, and slowly driving the asteroids of the belt into the inner and outer solar system.

Mars is closer to the asteroid belt than the Earth and Moon; in fact, it can be said that Mars defines the inner edge of the asteroid belt. Asteroids of all sizes are being driven inward toward the Sun by Jupiter. If they get past Mars they hit Earth eventually. The asteroid belt is thus the source of most meteorites that fall on Earth. Their orbits can be calculated back to the

asteroid belt by tracing the fiery tracks meteorites make when they enter Earth's atmosphere. However, this whole arrangement makes Mars the target for most asteroids fleeing Jupiter's influence. This means the rate of meteors hitting Mars is probably much higher than those reaching the Earth and Moon. Thus, argued some, using the lunar crater chronology would give wrong ages for Mars. If the cratering rate was higher than the Moon, then the ages of everything on Mars would be younger than estimated by the lunar method.

The Mars community solved this problem in a creative way. Headed by the eminent Mars scientist Charles Hartmann, who is a talented painter and an author as well as a scientist, a group proposed a table of ages for many regions and features on Mars, where the cratering rates were considered to be 1x lunar, 2x lunar, and 4x lunar. The 2x lunar rate was considered most likely, given Mars's proximity to the asteroid belt, and gave a set of ages that showed Mars to be a dynamic planet until two eons ago.

If the ages of the water channels on Mars were younger than supposed, then this would mean that Mars' climate was Earthlike for a large portion of its history. The liquid state is the most precarious of all states; gases and solids can exist in a broad range of temperatures and pressures, but liquids cannot. This property of liquids is especially true of water. If liquid water existed somewhere, a narrow range of temperatures and atmospheric pressures must have existed in that place. Accordingly, liquid water defines the Earth environment in terms of pressure and temperature and therefore defines the only known environment that supports life.

On July 20, 1976, in orbit around Mars, the American Viking Lander 1 fired its explosive bolts and was freed of the Viking 1 mother ship. Falling from orbit, it lit up the russet Martian sky like a meteor as it fell and its heat shield turned white hot from the friction of the hypervelocity probe with the atmosphere. A mile above the surface it jettisoned its heat shield and a drogue parachute deployed followed by the larger main parachute. It then slowed in the thin Martian air, which was fortunately not disturbed that day by a dust devil near the landing sight. The lander radar probed the onrushing ground below. Fifty meters from the ground the computer signaled that a firing solution had been found. The parachute lines were severed by an

explosive charge and on pillars of flame from its rocket engines the craft descended the remaining distance and then settled to the ground. For the first time, a human creation had landed intact on another planet. It had landed in Chryse Plantia, “the fields of gold” at the place where three former water channels had emptied in times past.

The craft immediately went to work pleasing its ecstatic controllers at the Jet Propulsion Laboratory in Pasadena. It took images of the Martian landscape, showing it looked like desert in the American southwest. Strangely the exact color of the sky at various times of day has provoked debate until this day, for the methods used to determine the right color balance in the images were also subjects of debate. It was an omen of things to come, for the results of the major experiments carried on the probe were to provoke a debate that rages until the present.

Soon after the dust had settled at the landing site, the probe scooped up some soil and carried it inside. The soil was to be tested for signs of life. Three tests were performed: The Gas Exchange Experiment, which looked for respiration by possible microbes in the soil; The Labeled Release Experiment, which looked for ingestion of radioactively labeled nutrients; and The Pyrolytic Release Experiment, which looked for signs of bacterial growth using radioactively labeled nutrients. To make a clear differentiation, half of each sample was heat sterilized to kill any Mars bacteria and then tested also.

Based on the protocols worked out on Earth in comfortable conference rooms, before the Viking probes were launched, the life tests were positive. But the lander was on the cold plains of Mars while, in the russet sky, two moons named Fear and Terror moved overhead. The results were not tidy, not like Earth-life. Weird chemistry was going on in the life experiments. Only the Labeled Release experiment was giving results precisely as predicted for life, and the protocols called for two out of three experiments.

The human race was suddenly poised at a precipice. To accept the verdict of life, based on the experiments on Mars, would create a firestorm on Earth. The human race would be demoted from being the master of the center of the biological universe to being the occupants of a speck of dust, and not a particularly large speck of dust. Many questions would be asked also of the

powers that be, and this would lead to trouble. To plunge humanity into such a crisis required unambiguous proof of life, not just evidence.

The samples were put in a gas chromatograph on board the lander and cooked to see if any humus existed in the soil. They could find none. In fact the whole Martian surface was being sunburned by harsh ultraviolet light from the Sun, with no ozone layer or thick atmosphere to mitigate it. Not only would most Earth life die instantly under those rays, but even the organic molecules that made up the dead organism would be hammered to pieces by the photons of that light, sunburned, or photolysized into carbon dioxide and water. Despite the fact that the life experiments were far more sensitive to living things, since things could grow and multiply from a single spore in them, and the fact that the gas chromatograph was never proposed as a test for life when the mission was planned, the gas chromatograph results were invoked to bring closure to the debate. The verdict was that no life had been found on Mars. Two men who were part of these councils objected strenuously to this opinion: Robert Jastrow and Gilbert Levin, who had designed The Labeled Release experiment and knew that its results were actually definitive.

The confusing results of the life experiments were explained by “weird chemistry” in the soil. A dozen Byzantine but lifeless chemical processes were trotted forth to explain the positive life results. The fact that many of these processes were shown to be inoperative as quickly as they were proposed was not considered important; everyone knew Mars was like the Moon. Besides, did not Ockham’s Razor say that the “simplest hypothesis” was always the correct one? Was not life complex, and therefore never the simplest hypothesis? So the life experiment results, and every other strange thing seen on Mars, were automatically given simple, and therefore, non-biological explanations. This reflex rejection of “life-as-never-the-simplest-hypothesis” became ingrained in Mars science. Just about any hypothesis, no matter how arcane, will be entertained at a Mars conference, as long as it does not involve biology or the conditions conducive to it. This mindset has continued since the Viking life experiments in 1976 and has led to a crisis in science.

Back on Mars, however, the rest of the Viking lander team was having a

happier time. The determination of the atmospheric composition was quite fascinating and so were the mineralogical and chemical analyses of the soil. The atmosphere was mostly carbon dioxide, but it had a few percent nitrogen, considered necessary for plant life to live. Beyond that it was one percent argon, a generally harmless gas similar to helium, and found in the Earth's atmosphere. However, a strange thing was found the fourth most abundant gas in Mars atmosphere was oxygen, not a large amount, an eighth of a percent, but much more than expected. Carbon monoxide, was found also, but only half as much as the oxygen.

It had been expected that carbon monoxide would be present in much larger amounts than oxygen, since it was formed by ultraviolet light striking the carbon dioxide molecules and splitting off an oxygen molecule. This expected process would make two molecules of carbon monoxide for every oxygen molecule, but the relationship was reversed. Two times as much oxygen as carbon monoxide was found. Added to this the oxygen was released as atomic oxygen and was supposed to combine with the soil or float away into space leaving the carbon monoxide to dominate. Instead molecular oxygen was dominant. Somehow, the orphan oxygen atoms were finding each other and making molecular oxygen. It did not make sense. The soil had been found to contain oxygen also, and to release it when exposed to water or heat. This had been an enormous headache to the life experiment researchers. Water vapor in interesting amounts was also found, but given the cold and thin atmosphere the air was very dry by Earth standards. This raised the perplexing question of where the water vapor was coming from, and how much was there at the source, but the soil held distractions from further debates.

Viking lander instruments did a complete chemical assay of the soil. The results were surprising but in a pleasing way. To the relief of the lander team the results raised no immediate questions concerning biology. The soil was full of iron in its most oxidized state called hematite. The age-old question of why Mars was red was answered: It was full of rusty iron. The soil was otherwise unremarkable: To most humans, it looked like every day dirt from some region with a lot of old volcanoes. Later a strong match would be made with volcanic soil from the slopes of Hawaiian volcanoes. Another good match was to mix 50-50 pulverized basalt with powered CI meteorite. CI

meteorites were an exotic meteorite believed to be clumps of the primordial dust from the nebula from which the planets formed. Because of this apparent primordial origin, the CI composition was used as a standard to measure the composition of samples of anything from outer space. Their composition was thus well known. However, after some discussion, the idea of the CI or any other meteorite originating from Mars was dismissed by the survey team as completely implausible. They quickly moved on to other fascinating things found in the soil and other things fascinating because they were not found.

The early soil analysis produced an interesting oceanic clay called montmorillonite. It was also salty, and was encrusted with a sulfate rich "caliche," like Plaster of Paris, as found in dry lake beds. Lots of the soil particles were magnetic, suggesting headaches for future explorers. However, no nitrates or carbonates were found, and this was unexpected. Nitrates were expected since nitrogen and water vapor were in the atmosphere and the ultraviolet light would break up the family of existing molecules so that, when molecules reformed randomly, some nitric acid would form. Nitric acid forms from hydrogen, oxygen, and nitrogen on Earth whenever a large amount of energy is injected into the atmosphere, such as by lightning, hot flames, or nuclear explosions. Plenty of nitric acid ingredients were found, and some scientists had predicted that nitrates would form a layer a meter thick on the surface because of the ultraviolet energy. Despite the fact that traces of nitric acid precursors were found in the atmosphere, no nitrates were detected. The biggest surprise was another absent mineral.

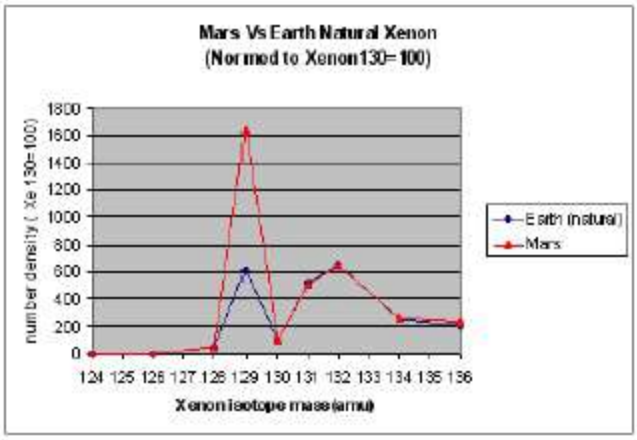
Despite the presence of water vapor and carbon dioxide in the atmosphere, which together make carbonic acid, no carbonates such as limestone were found in the soil. This was deeply puzzling since all ingredients for limestone or dolomite, calcium and magnesium, and carbonic acid were present, yet no carbonates were detected. Iron also forms carbonate under circumstances that should have been present on Mars, especially on an early wet warm Mars in the primordial chaos. But carbonates were missing in action.

The final mystery, so full of portent, was the isotopic composition of the atmosphere found by the landers. The elements are distinct chemically, but this is a property of the number of electrons they carry. Balancing the number of electrons to make the whole atom have zero charge are the same number of

protons in the nucleus, thus the identity of the element is determined by its number of protons. This is called its atomic number. However the protons are all charged positive and yet are compressed together in a nucleus. Like charges repel so the whole thing should explode, and sometimes it does. What prevents the nucleus from exploding most of the time is a sort of nuclear glue carried by particles called neutrons, which true to their name, are neutral. The neutrons allow the protons to stick together in the nucleus, the nuclear glue is a short range force called the strong force, unimaginatively named because it is stronger than the electric force which causes like charges to repel. Elements can exist which have more or fewer neutrons than the standard number, resulting in the same chemical properties but different masses; atoms of the same element with different masses are called isotopes. Most elements have several stable isotopes. Processes in nature can separate isotopes and these processes leave characteristic clues as to their nature. The simplest process is gravity, which allows lighter isotopes to rise to the top of the heap. Chemical reactions also sort isotopes by weight because the heavier isotopes move more slowly at the same temperature and so get left behind while the light isotopes react with other elements. Heavy water is formed by electrolysis of ordinary water, because the heavy isotope of hydrogen, deuterium, stays in the water while the light hydrogen reacts with the electricity and bubbles out as gas. This is why it takes large amounts of electricity to make heavy water. Similarly, uranium for nuclear work is enriched by sending it though filters as a gas;, the heavier uranium 238 is slower than uranium 235 that is used for nuclear fission; after passing though many filters, uranium hexafluoride gas becomes more and more dominated by U-235. This takes a massive operation and lots of power. In general when you see abnormal ratios of isotopes, it indicates powerful things have happened to alter their natural balance.

The isotopic ratios found in the Martian atmosphere were startling. The argon was almost all argon 40, a heavier argon isotope. This was much different than on Earth where argon 38 is present in large quantities. Argon 40 is formed by the decay of potassium 40, a long-lived radioactive element found naturally mixed with its stable isotope potassium 39. The preponderance of argon 40 suggested that the soil would be full of potassium; however, the potassium, normally a minor element in Earth soils, was barely

detectable in the Mars soil. The oxygen isotopes were nearly Earthlike; however, the nitrogen was disturbed relative to Earth, and the heavier isotope was more abundant. In the heavy noble gas xenon, a bizarre thing was found. The xenon, instead of being spread evenly in abundance over its five different stable isotopes from 128 to 136, like on Earth or in meteorites, was almost all xenon 129. The isotope findings were astonishing.



Mars and Earth atmospheric xenon isotopic abundance (JPL/NASA)(see color plates)

The second Viking arrived at Mars in early August after most of the shouting was over. Its mission was to support Viking [1] and was anticlimactic except for one nasty brawl over the landing site. The landing site was to be a place called Cydonia, but images from that area by Viking 1 showed it to be very rocky. One image in particular, from that imaging campaign caused a stir. It showed what looked like a large carved face, causing much controversy. The reader is referred to the excellent book “The Case for the Face.” The Viking 2 lander was finally set down in a place called Utopia, in what unexpectedly turned out to be a field of boulders, but which miraculously the lander had missed. The lander 2 experiments gave results strikingly similar to the Viking 1, including the life experiments and the soil analysis, despite landing on the other side of the planet at a much higher latitude. This similarity showed that forces on Mars had ensured the planet’s surface was chemically very uniform.

All in all, the Viking probes were a glorious success. The skill, the mastery, and the daring and raw luck displayed by the whole Viking team continues to amaze. They handed to humanity the keys to an enormous library called Mars, full of mountains of information. The fact that some of the data was so surprising added in a way to the glory; they were after all gatherers of data, and it was the glory of such data gatherers to find the unexpected. That they could not explain all of what they had found even added to the glory.

> But at one point, it can now be known, two men who were experts in nuclear physics and instrumentation who oversaw the isotope assay of the atmosphere reacted when the xenon isotopic ratios in the atmosphere were announced, and stared across the conference table at each other with a momentary knowing glance. They then looked away lest any others would see their reaction. They had both seen that xenon feature before, in their other work, in a place neither dared to name."

That night, as I tucked my daughter Elizabeth into bed, I wondered what would be the impact of finding a dead civilization on Mars? It would forever change the course of human history, I thought. It would end the Cold War, and lead to a wild scramble to send an international mission to Mars, like the Apollo-Soyuz mission had demonstrated was possible by a linkup in space. The discovery of a dead civilization on Mars could lift the shadow of possible nuclear holocaust off the life of my daughter. She would grow up without having nuclear-war nightmares as I had experienced. For the first time in memory, I was filled with a wild hope that the Cold War could end peacefully.

Why did I react this way? Many Christians are wary of the idea of any kind of extraterrestrial life, but here I was not only open to the idea, but ready to embrace it if it meant a hope of ending the Cold War. This frame of mind was only made possible because for me in 1983 because of a spiritual crisis I had experienced in 1976, where I was able to come to terms with a living cosmos.

As I related in my book ***Cosmic Jesus:***[3]

> “In 1976 I was a graduate student struggling to complete my Ph.D. in plasma physics at the vast Lawrence Livermore National Laboratories in Livermore California. I had been raised a Presbyterian, however my parents had left that church when I finished high school and had joined a charismatic or neo-Pentecostal church, and I had followed them there. In the charismatic or “Holy Spirit Movement” I was to find a new level of spiritual awareness and awe. So I had moved from a rather staid and intellectual form of Christianity to a mystical and ecstatic form. My journey through that experience is too rich to explore here, however, it can be summarized that the fervent certainties of charismatic Christianity armored me against the many hazards of that time of early manhood in the early 70’s and found me safely pursuing my education many years later. Many of my friends had destroyed themselves with drugs. By God’s grace, I had survived. However, one by one, the fervent certainties I had embraced as a young man and which had kept me from many troubles, were now yielding to my increased experience and education. One of those certainties I had been taught was that no extraterrestrial life existed.

It is a remarkable thing to reflect on, that various pastors in the charismatic movement would pronounce themselves experts on exobiology, especially since their education was usually limited to Bible college; however, I had heard from several pulpits that no living flesh and blood lay beyond this Earth. According to them, the great drama of God’s plan was being played out here on this planet, and to be concerned with anything else in the universe was dangerous nonsense. This viewpoint enforced a considerable simplification on the universe, and thus kept one focused. However, such a view was a rejection of modern science. The neo-charismatic movement was partly an out-growth and partly a reaction to, the counter culture, and, like the counter culture, rejected modern science and its materialist goals. It must be also remembered that the whole Christian fundamentalist movement, of which the charismatic movement was a part, was convinced that the world was ending, that Christ was returning, and that this was no time to dwell upon distractions. One of these distractions was the search for life on Mars and by extension the whole cosmos.

So it was in June of 1976, with the Viking probes nearing Mars to look for life. I was confident they would land successfully. It appeared unlikely, even to me, that the return of Christ was going to occur before the Vikings performed their fateful tests on the Martian soil. Fateful tests they would be, for if the Vikings found life, it would refute what I had been taught and it would, according to some statements by atheists I had read, would refute the whole Bible. My journey of faith from late adolescence to early adulthood had already included some rude shocks and I feared the discovery of life of Mars might be an unbearable one. Yet I was torn. I was a Christian, but also a scientist in training. The discovery of life on Mars would be a triumph of science, the science that I had followed fervently in my youth as a Presbyterian. The Presbyterian and the Charismatic, therefore, wrestled in me.

I found my way out of this crisis in a rather dishonest way. I decided that the Vikings would find no signs of life and that Mars was in fact as dead as the Moon, as some scientists had insisted. This intellectual pose allowed me carry on my studies without further angst and was vindicated when the official verdict was read, some months later from Mars. Mars was officially declared dead in late summer 1976. However, I was to find out later that the U.S. government had experienced the same crisis as I had and had availed itself of the same intellectual escape route, though with slightly more vigor. What was more important, however, was through this crisis that I had become intensely curious about what the Bible actually said about extraterrestrial life rather than what I heard from the pulpit. I began to look on the Bible as a source of truth beyond just the spiritual, but a source of truth in all areas of human inquiry.

I had once made a careful study of a widely held concept concerning the return of Christ, the Pre-Tribulation Rapture, the concept that all Christians would be evacuated before the four horseman of apocalypse (war, pestilence, famine and death) had a chance to ride. In my studies of the Bible I found that this “emergency evacuation,” while comforting, was highly problematical in the scriptural sense. It was like being on a cruise liner and discovering by a discreet investigation that there were not nearly enough lifeboats for all the passengers. When I mentioned this problem privately to the rather frazzled and overworked pastor of my church, he agreed and then

told me not to tell anyone. I was stunned by this reaction but did as he requested.

I think I experienced my first adult thought that day: the understanding that when one is figuratively Moses leading the Israelites across the desert, one must keep everyone focused on the Promised Land ahead of them and leave other details to be sorted out on the other side of the Jordan. I think of this whenever I consider the role of the government in these matters.

Heavenly Being depicted in a Medieval Painting

Another thing I had learned from my fervent studies of the Bible as a charismatic Christian was that the Bible was often a mysterious book, especially when consulting the original Greek and Hebrew, and that occasionally the pastors I listened to would translate that sublime complexity to the congregation on Sunday as a cut-and-dried certainty.

So I embarked on a journey through the doorway of the Bible, beyond the blue skies of Earth, into the starry cosmos. By the end of my journey I had become convinced that rather than not mentioning extraterrestrial life the Bible was full of explicit and implied references to it. The angels were extraterrestrial intelligences and were mentioned frequently. Also were mentioned, the mysterious “Sons of God,” who admired Earth women and had children by them, these children becoming “great men, about whom many legends were written.” Some Bible commentators had written that the ‘sons of God’ were angels. However, these beings, whose behavior was hardly angelic, were then

the stuff of legends, and perhaps even part of our genetic makeup. They were in behavior and off-spring, men, in every sense of the word. They were apparently very humanoid extraterrestrials, in both genetics and behavior. So we were not alone, I had concluded.

I had also concluded, that just like my "not enough lifeboats" discovery concerning the "pre-tribulation" rapture, I would follow my overworked pastor's command and "not tell anybody." However, for me as a scientist, this knowledge was deeply important and reassuring, for I was convinced that in my lifetime extraterrestrial life would be discovered."

That night on the day after Christmas, I tucked my daughter Elizabeth into bed and read her a bedtime story, but I could not stop thinking about what I had seen and its possible implications. Could it be that a dead civilization lay undiscovered on Mars? How would such a discovery affect my daughter's future? Would it give her a future free from the threat of the Cold War and nuclear annihilation? I concluded that such a discovery as a dead civilization on Mars could possibly end the Cold War and force humanity to reconcile their internal differences. It would be like the discovery of America energized the late Renaissance. Great minds, I thought, must be preparing to investigate this possible epic discovery. Myself, I simply wanted to know more.

So it was then, on the night after Christmas in Albuquerque, that I was drawn into the great mystery of Mars. The Red Planet now held a puzzle far deeper and darker than I had ever imagined. Yet, I now had hope, hope for Earth and its people. Suddenly, a possible conceptual path out of the deadly quandary of the Cold War was visible to me. That same Red Planet whose influences had created the Cold War and whose massive dust storm had written a message of doom to all who worked in it, now beckoned me with a Death Mask of one of its previous inhabitants. It said ***"follow me, and learn my tale of woe, so I will not be your fate…"***

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1. *Cosmos,* Sagan, Carl. New York: Ballantine Books, 1985 p.108.
2. *Life and Death on Mars : The New Mars Synthesis,* John E. Brandenburg Adventures Unlimited Press, Kempton IL 2010, p.104
3. *Cosmic Jesus: The Metaphysics of how the God of Israel became the God of the Cosmos* John E. Brandenburg Adventures Unlimited Press, Kempton IL 2010, p.14

Chapter 2 Tears for Alderann

"Those who do not protest absurdity, will ultimately become its guardians"

J. Bottaro PhD

I returned to work after the holidays and joined my colleagues around the coffee machine. Everyone was in a good mood. They were all brilliant scientists and engineers, and I was honored to be working with them. Many of them were working on controlled fusion, hopefully created by focusing beams of ions, atomic nuclei stripped of their electrons, onto pellets, a similar effort to laser fusion. The jet fighters were all taking off and roaring over the building as they turned to scream south to target ranges in the desert near White Sands to the south. Nearby, at the nuclear EMP (Electro-Magnetic Pulse) simulator facility, they were testing whether a five ton Army truck would still be able to carry cargo after a nuclear attack.

Even that grim chore had its farcical side. One of my colleagues regaled us over coffee with an account that he had heard at a New Year's Party, of a then recent fiasco involving the EMP testing. It seems that in the last months before Christmas, a defense contractor had purchased a brand new Cadillac or some other big pricey car, and had zapped it with nuclear EMP as an experiment to see if civilian cars would work after a nuclear war. The results had been predictable. The electronic ignition and fancy electronics in the Cadillac had all become "toast" from the simulated nuclear EM microwave shockwave and the still-shiny new car would not function afterwards. However, rather than simply junking the car after this test, the defense contractor had gotten the brand new looking car running again and, apparently to make their accounting department happy, had sold it to a used car dealership. According to the account, the beautiful-looking car had been immediately snapped up by an unsuspecting customer of the used car lot, who had driven it ten miles down the road before it suffered an electronic "grand mal seizure" and had quit in the middle of traffic in downtown Albuquerque.

In the lawsuit that followed the lawyer for the unlucky customer had charged that the defense contractor had sold unsuspecting civilians a “car that had been bombarded with nuclear radiation” causing his wife to become frigid, etc.…The customer had collected a ‘handsome sum’ from the contractor, who had then fired their chief financial officer.

The crew I worked with at Sandia was thus in a good mood, the pall of depression induced by the Nuclear Winter articles had been lifted by the holidays. The banter continued to be outrageous and happy. The news had told of a woman scientist that had just been promoted within NASA. She had been a classmate at Stanford of one of our physicists.

“Well George, was she a screamer or a groaner?” asked one wag. Flushing bright red, the physicist had simply smiled and drunk some coffee. I then spoke up and mentioned the Face on Mars program I had seen.

A stunned silence followed my mention of this occurrence. On the faces of my fellows, I suddenly saw a shadow of fear. It quickly turned into annoyance. “That’s crazy!” said one. “They didn’t have anything like that on TV!” The planet Mars had already delivered one shock to my fellow scientists the previous year, the Nuclear Winter, and the fact that a nuclear war would doom everyone. Now I was the bearer of even more fearful tidings from the Red Planet. Like the electrons I studied, they were afraid of their own image.

“It was on TV,” I answered defensively. I was amazed that no one else seemed aware of it, and their fearful reaction. “It looked very impressive.” I added. I was now confronted with skeptical and annoyed stares. Fortunately, a woman physicist named Mary-Anne, who I always liked, came to my rescue.

“Oh, I saw it too. It was pretty interesting.” She said, filling her coffee cup and departing. . This filled the group with puzzlement, and we all began to go to our offices and start work. A new and fateful year at work was beginning.

“I’ll find out more,” I said, feeling challenged. “I will make a report on what I find out.” Many nodded with satisfaction at this, now clearly curious. Because of my dispute over electron beam stability I felt my credibility as a new scientist at Sandia was constantly being questioned. I resolved to prove

that I was not talking nonsense. I also learned something in that moment. I had learned that for scientists in my field, the image of a carved human face staring at us from a devastated wasteland of a planet was perhaps the most terrifying image imaginable. It implied, somehow, that we ourselves were doomed, along with everything we loved.

In my office I quickly used the government phone service to contact Goddard Space Flight center. An annoyed sounding secretary connected me to Vincent DiPietro himself. Delighted to be speaking to him, I listened as he explained that his work with Molenaar was not part of some NASA project, but their own investigation. I was disappointed to hear this last part, but he then promised to send me several pamphlets they had printed up on their research, which filled me with joy. He also mentioned that they had found a pyramid near the face, and pictures of this object were also in the pamphlet. I thanked him profusely and told him their research was very interesting. I then ended the call and began once again my struggles to understand the electron beams crashing through the air, making a plasma sheath in which the electron beam saw its own reflected image and thrashed around wildly to escape from it.

I now understood why the secretary at Goddard was annoyed. This was not an official NASA investigation and yet DiPietro and Molenaar had obviously stirred up a lot of phone calls to Goddard Space Flight Center. This was a “bootleg” science project, a concept I was thoroughly familiar with from my years at Livermore. There, I had seen real science advancing on its ragged edge, and often the people making the most progress were the eccentric rebels of science. These brilliant odd balls often would try out experimental concepts in “bootleg” fashion, without official permission or funding. These experiments failed more often than not, but sometimes, late at night or on the weekend, or even over the lunch hour, a major discovery would be made. I would make several discoveries in this same fashion.

Science, as I was experiencing it in my first professional job, was not the detached scholarly enterprise it was made out to be in popular culture. It was more like a rough game of tackle football. But I had liked tackle football. I had arrived at Sandia as a brash young scientist, eager to prove that I was the best physicist on the planet. One particular senior scientist on the project, had

found me annoying and, in an apparent attempt to put me in my place, had contradicted my analysis of a key equation related to electron beams. This had been in front of everyone at a project meeting. My supervisor had pressured me at the time to retract my analysis. In the following tense meeting in his office, I assured him I would retract my analysis, but only after he spoke with the nation's expert on the electron beam theory in question. That expert was Edward P. Lee, whom I knew from my years at Livermore. To the consternation of my boss, Ed Lee had confirmed the correctness of my analysis. My boss, rather than being pleased with me, was flabbergasted and angry. Finally, the senior scientist had retracted his analysis, but now viewed me with enmity. This had all occurred several months before. I was scoring points but making enemies. Tom, another senior scientist at Sandia, is very supportive, however, Tom realizes that science is a business, a profession, not just a search for truth. He gives me good advice, but I do not follow most of it.

Sandia Labs was not Livermore, I had discovered, where doing good physics was what mattered. Livermore was run by the University of California; Sandia was run by Bell Laboratories, a corporate entity. Bell Labs, while accomplished, had a very "top-down" management style. I now had a reputation at Sandia as a troublemaker who bucked authority. Alas, I had bought a house, and my lovely wife, who was part Native American, loved Albuquerque because it made her feel close to her people. To find a different job and move to a different place was unthinkable. I would simply have to stand and fight where I was. Fortunately, I had been raised in the rough logging town of Medford Oregon, had been in several brawls in high school, and was half Viking. My middle name was Einar, meaning "The Warrior" or "Warlord."

A week went by in the fateful new year 1984, and as I waited for the pamphlets to arrive from Goddard, my thoughts of Mars were interrupted by a two stunning developments.

An experimenter named Mike came rushing down the hall to my office.

"You were right John! You were right! The rifled beams fly straight!" He had just come from an experiment where they had fired electron beams into the air for several feet, at what passed for atmospheric pressure in mile-high

Albuquerque. He had pictures. They had fired the beam at full power without spin, into the air, and as usual it had thrashed around wildly in the air, trying to escape its own image in the plasma. However, they had then put spin on the beam by a powerful magnetic field in the beam accelerator, and it had then flown straight as an arrow in the air for several feet. Like rifling on a bullet makes it fly straight, the beam had been stabilized. In my theoretical interpretation, it had seen its image uniformly everywhere, had thus seen balance. The spinning electron beam had embraced its own image after seeing it all around itself. I had been proved right.

I was ecstatic. I had toughed it out and was now being vindicated. Together, we marched down to my boss's office and the experimentalist explained the results to him while I stood by beaming. To my dismay, my boss simply presented his poker face to me and shrugged. It must be understood that I liked my boss, despite his remoteness, and respected him. I felt badly that I had created a situation where he was now under pressure to get rid of me. Perhaps the new results made no difference for my own fate, I thought, but it was good news for the project, and that was my job: to help the project succeed. In my view I worked for the United States government, of which Sandia Labs was merely an agent. I had advanced the electron beam project to defend the country. I thanked Mike as I walked back down the hall. I was pleased to be found correct, even if, incredibly, management appeared to have already "written me off" as a trouble maker.

The second thing happened a few days later was distributed as a memo. It was the news that the "Star Wars" defense initiative, announced by President Reagan in a speech in March 1983 was beginning to become a defense funding priority. Space weapons, rather than the directed energy weapons for use in the atmosphere, would become the new goal. This meant there would be a reorganization at Sandia soon. Such upheavals were standard in our area of research, and I hoped it would mean a transfer to another department with a different supervisor. It would mean less pressure on him to find fault with me.

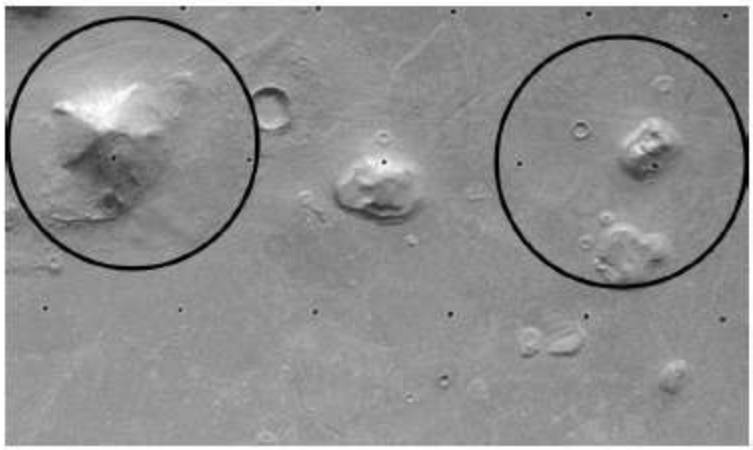
From the days of Sputnik, space had always been a realm of defense as well as science fiction. The success of the Space Shuttle program had demonstrated that America had space supremacy. Therefore, when President

Reagan had announced that a space defense system against nuclear missiles should be constructed, it seemed to make sense. This had all been greeted with enthusiasm by me and my colleagues. All of us hated the concept of mutual assured destruction or MAD that was our present defense strategy. MAD was basically based on holding your enemy's women and children hostage- 'if you kill mine I will kill yours.' This was a distasteful and nihilistic approach to defense and I was eager for an alternative. Space had always fascinated me and now it would be the next frontier of defense research. Actually, like many of my colleagues, I felt a great deal of skepticism as to whether the space-based defense was actually feasible, but it didn't matter what I felt. Sandia was going to embrace space defense. So everyone was thinking about space when the Di Pietro and Molenaar Mars pamphlet's arrived at my house. My wife was now wary of the whole subject of Mars. She agreed the images were genuine, but she commented fearfully,

"I think this thing will get you fired"

I assured her that I would not let it distract me from my work.

The reaction of my colleagues to the pamphlets the next day at work was astonishment. [1] There were the two images of the face in Cydonia, and three images of the DiPietro and Molenaar pyramid, apparently five-sided. The pyramid was approximately 1 kilometer tall and three kilometers at the base, the same size as those in Elysium, and with the same apparent disregard for rectangular construction. DiPietro and Molenaar had carefully documented their work, so I, as a scientist, and others as engineers, spoke with admiration of it. DiPietro and Molenaar had obtained the original data tapes of the Viking images and enhanced and enlarged the images of the face in them using the latest in computer imaging techniques. The tapes consisted of arrays of 8-bit computer words: bytes. Each 8-bit word controlled the shade of gray of a pixel (picture element). For 8 bits this meant 256 shades of gray. Each picture was formed of approximately 1000 x 1000 pixels.

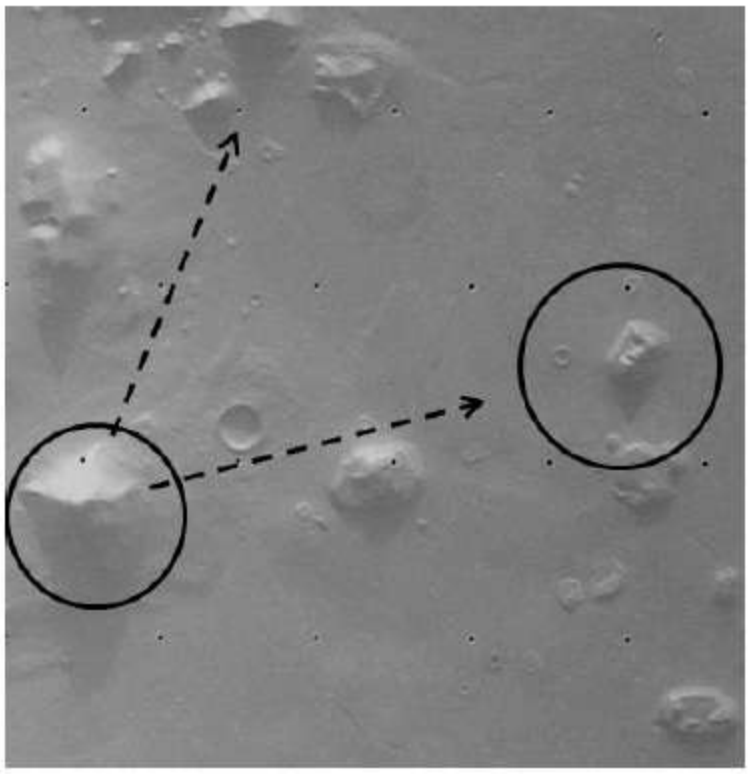


Viking Frame 70A13 showing the face in Cydonia and the D&M Pyramid (both circled)

One of my colleagues dismissed the pictures as merely a Martian version of the “Old man of the Mountains “, a natural feature resembling a human face in New Hampshire. I conceded that all of what was seen in Cydonia could be just random products of erosion. However, I noted that the presence of the Face near to the Pyramid argued otherwise. Two rare but different objects next to each other suggested that they were correlated. That factor of correlation had to be intelligence. In this, I remembered where I worked, and the motivations of the projects on which I labored. I was not working on a ‘science project,’ I was working on important defense project in the Cold war. This required a different mindset than pure science. In pure science one could view the test tube and its internal activities with detachment and perfect objectivity, however, in the defense field, one was very much inside the test tube and one labored for results, not detachment. In my view, I and the whole human race was in the great cosmic test tube with Mars. This granted a face next to a pyramid significance.

The Old Man of the Mountains

Truly, humans are “hardwired” to find humanoid faces in the visual clutter of the landscape. Given the long pre-history of the human race as fierce warring tribes, the genetic tendency to spot a face staring at you through the forest, even if was wearing warpaint, was undoubtedly a gene favored to be passed on to future generations. This fact, dictated by the law of the jungle of our past, is little appreciated in comfortable modern drawing rooms. The same can be said of being able to spot straight lines in the irregular scenes of nature. Spears and arrows are straight so they can fly more accurately. Hence, the ability of primitive tribesmen to spot straight lines in the clutter also was rewarded with long life and many children. Thus, both the tendency to recognize faces and straight lines in the jungle foliage, even if they are false alerts, are skills that aided survival in the savage jungle of our past. These skills aid us even now in a world where humans are the most dangerous creatures we know.



Viking Frame 35A72 showing Face and D&M pyramid (circled)
Dashed arrows point out alignments between pyramid vertices and Face and "city complex" found by Richard Hoagland

I called DiPietro and thanked him for the pamphlets and told him I thought the images were everything he said they were. He was pleased and then mentioned that a group of scientists and engineers was being organized to investigate the phenomenon further and suggested I contact a person named Richard Hoagland in California, if I was interested in joining the group.

I thought deeply about it, and on the way home stopped at the library and checked out several new books on Mars. One of the books, ***The New Solar System,*** showed the face on Mars with the caption "A sign of civilization?"[2] Another book, ***Mission to Mars*** by James Oberg, even gave favorable mention to the work of DiPietro and Molenaar.[3] However, I was already involved in one informal group called "Peacemaking" that met regularly at our church, and was reluctant to take on anything else.

Our Presbyterian church was an eclectic mixture of highly educated professionals who worked either at the University of New Mexico, and thus

were quite liberal, or worked for Sandia Laboratory, the Air Force Weapons Laboratory, or the defense contractors who served them, and were thus fairly conservative. Our Peacemaking group would meet and discuss various aspects of the Cold War and the role of Christians in it. The past year I had proposed the initiative that the Presbyterian Church should work to make the United States give up its “First Use “of nuclear weapons option and adopt a “No First Use” policy. This idea had been suggested in an article by McGeorge Bundy and several other foreign policy specialists in 1982.[4]

I was more aware of the realities and assumptions surrounding this idea than most since I had gone to school at a nuclear weapons lab: Livermore. I had been working on Laser Fusion, down in the nuclear weapons end of the lab, when the “Neutron Bomb” debate had occurred during the Carter administration. The Neutron Bomb was a small hydrogen bomb that minimized blast and heat output in favor of neutrons. It also made very little fallout. As nuclear weapons went, it was clean and tidy. As one of my co-workers noted without irony:

“It just kills the people but leaves all the valuable stuff: buildings, factories, et cetera, unharmed.”

It had been invented to offset the strong advantage the Soviets forces held over NATO in conventional weapons. Neutron bombs were much cheaper than stationing two more American armored divisions in Europe. One of the inventors of the Neutron Bomb, a man obviously pleased with himself, worked down the hall from me while I worked on Laser Fusion. I asked him at one point, while we both stood by the coffee machine:

“Suppose the Russian tank columns come pouring over the West German frontier one morning, and we fire a neutron bomb at them. Won’t the Russians just respond with their crude and dirty nuclear weapons? “

He merely smiled broadly and replied:

“We have strong reasons to believe they won’t do that.”

Stunned at this response, I had wisely just drunk my coffee and nodded agreeably. What I had heard was “profound bullshit” -the firing of a neutron bomb or any other nuclear weapon at the Russians would cause them to respond in kind. So I had more grasp than many in our Peacemaking group of

the grand delusions surrounding American nuclear weapons policies.

Everyone in the Peacemakers group had liked the idea of endorsing “No First Use”, liberals and conservatives alike. However, we had spent endless hours trying to come up with the precise wording that everyone could agree to, and we still had not arrived at it. Accordingly, I was reluctant to join any new group looking at Mars. But, I brought all the Mars books home and began studying them anyway.

My wife was involved in the Sanctuary movement at the church. They were seeking to help refugees from the wars in Central America that were fleeing to the U.S. The sanctuary movement people at our church worked with many people in the Catholic churches in Albuquerque, some of whom were actively hiding illegal aliens from Nicaragua and El Salvador, which they considered war refugees. My wife was working with these peoples. It all seems insane now, in the New Millennium, but this was the Cold War in the Southwest in the 1980’s, when all good Godly people were trying to head off Armageddon and its collateral damages in the evenings and weekends, then being employed by the Cold War during the work-week. The times cried out for people of conscience to do something to change the terrible course the world was on. We were on a course, I felt, must sooner or later lead to nuclear holocaust, if only by accident. I felt that cry urgently within myself.

Pershing II Missile being deployed in West Germany

What I could not know at that time, indeed it was highly classified, was the fact that the in November of 1983, the world had come as close to nuclear war as during the Cuban Missile crisis. The year 1983 had been a bad one for the Soviets. They had shot down an airliner, KAL flight 007, and been condemned for it. Reagan had announced his Star Wars defense program, which they neither understood nor could duplicate. NATO had been preparing to deploy nuclear Pershing II and Cruise missiles close to their border, their casualties were mounting in Afghanistan, and all of this contributed to a besieged and rattled mindset in the Kremlin. Then in November a NATO war exercise was staged, called Able Archer, that for a short period, had convinced many Soviet Generals that NATO was about to mount a massive attack on them.[5] They had placed their nuclear forces on their highest possible alert short of war. One off-course jet fighter, one false signal from an early warning satellite, one group of red balloons released near the East-West German frontier by some children, like the song on MTV, and tactical and then strategic nuclear weapons would have been unleashed.

US M60A3 Tank in a 1980's NATO exercise

As I had been told at Livermore: war games had indicated, as in the movie ***War Games,*** that a nuclear war, once begun with tactical weapons, would blossom in hours into a full blown global nuclear exchange. These studies had concluded that nuclear war did not have a slippery slope leading from tactical to strategic phases, it was a sheer cliff. The chief problem was that nuclear weapon detonations disrupted communications and intelligence capabilities so rapidly that commanders would quickly panic and would then fire every weapon in their arsenals. Realistic war games had shown that commanders on both sides did this to prevent the possibility of their weapons being 'caught on the ground.' The 'fog of nuclear war' was much more intense and impenetrable than even the fog of conventional war. It was not a fog but an inky black cloud, and led far more quickly to a "now or never" mindset regarding nuclear launches. So it was perhaps the fear of the collective human unconsciousness that knew how close it had come to collective death, that we were all reacting to in early 1984.

At work things had gotten better; my nemesis got up at a project meeting and was presenting some computer simulation results for spinning electron beams. I was startled to see, in his own results, the "skewed" fire-hose spectrum, that I had predicted from my own theory. He talked away and made no mention of it. I finally cleared my throat.

"Excuse me, isn't that rotating beam spectrum skewed, like I predicted several months ago from my theory." There was a long silence in the room. My nemesis smiled blandly, he looked at the graph, which had now

reappeared on the screen.

“Why, so it is,” he said smiling. I had won the theoretical argument. As I would find out later, I had already lost the war, but I had done my job and saved the project.

I mention this story to point out, that even in the gleaming halls of science, in the heat of rivalries, even scientists will try to “pull a fast one.” That is, present results as showing one thing, when they actually mean the opposite.

Now computer simulations had showed my theoretical models were correct as well as experiments. I suddenly felt very confident. E.P. Lee, perhaps the best electron beam theorist in the country, agreed to work with me to develop my theory of spinning beams. I suddenly felt very confident as a scientist. I had acted on intuition, and my intuition had then been proved right. Perhaps I was as smart as I thought I was. Perhaps, because I felt so confident, I called Richard Hoagland.

Hoagland was indeed organizing a team of scientists and engineers to verify the research of DiPietro and Molenaar and investigate Mars in general. He called this the IMIT or Independent Mars Investigation Team. Hoagland was a former science reporter for CBS news and impressed me with his intellect and knowledge of space research. He in turn wanted somebody like me who understood defense and plasma science to balance out the team, which consisted of geologists, imaging and computer science types and an anthropologist. Both Hoagland and I agreed that the results of this investigation had the potential to change human history. It could set the human race on a new course, away from MAD and Cold War, to a Joint US-Soviet effort to investigate the dead Mars civilization instead. I was impressed but non-committal. I knew the whole subject was frightening to my wife. I knew it also would leave me open to charges of being a “crackpot” from my detractors at work, since the idea of a dead civilization on Mars was so far from what I understood to be mainstream Mars science.

I wavered for several days. The invitation to join the IMIT effort, which would be conducted by computer modems connected via free long distance phone lines, an anticipation of the internet, was tempting. But I already had a “full-plate.” I knew also, despite my recent vindication, that I had enemies at

work; they would pounce on any misstep, and I would have to leave. But I was also inspired by my Uncle, Physicist William Siri, who had been my hero since my youth. He was an ‘Indiana Jones’ sort of scientist, going to Antarctica, climbing Mount Everest. He had been part of the Manhattan project in the Second World War. He had helped found the Sierra Club, and served as one of their first Presidents. What would Uncle Will do? His health had declined badly, so bothering my Uncle with this momentous question was unthinkable. The decision was “on me.”

I agonized over the decision of whether to join the IMIT investigation or not for several days. Finally, I packed up all my Mars books and drove down to the library to drop them all off. I had resolved to be done with Mars. I was a Plasma Physicist schooled in nuclear energy; Mars was far outside my field. What could I possibly contribute to an independent Mars investigation? It was probably doomed to failure at best and dishonor and ridicule for its team members at worst. My career, once so full of promise, now seemingly was hanging by a thread. Sadly, so was my marriage. One false step and my career could possibly be finished and everything else with it. However, when I got to the library I could not stop the car, I found myself driving around the block over and over. I was praying for guidance. Suddenly, I turned and headed back home with the Mars books still sitting on the seat beside me.

I had reached a decision. I was going to join the IMIT investigation and help it with all the scientific talent I could muster. I knew those scientific talents were considerable and that they were a gift from God. I was going to turn them to the problem of Cydonia. I was now convinced that to turn away from such a scientific phenomenon, as the Cydonia face, a discovery that could forever change human history for the better, would be unconscionable in that perilous time I was living in. I decided to lay everything on the line, and I prayed it would turn out well for me and my family. I hoped that our research would help end the Cold War by convincing humanity that the whole cosmos beckoned to us, and we should realize our human fellowship in the face of that wide cosmos.

I was like the rookie Captain of a warship on his first patrol, and I had spotted what I thought was danger. Now after a moment of indecision, I had called the small ship of my talents and experience to battle stations, was

bringing it around to face the threat and then I attacked. The investigation of a possible dead civilization on Mars, a possible discovery so full of peril and promise for the future, would now have my full efforts to back it up. After much deliberation and prayer, the die was cast. I called Hoagland and told him I was “on board.”

I was able to get a phone-modem terminal from a friend at church. I t needed an extra cooling fan that I had to jury-rig. The modem only printed capital letters, making it seem to everyone in the IMIT phone conference that I was constantly shouting. However, I was soon in the thick of the action. I would spend an hour each night mulling over messages from the other IMIT members or the latest pictures in the mail, and responding. I felt like Bilbo Baggins in ***The Hobbit*** joining Gandalf and the band of Dwarves on the great adventure. Despite everything that would happen later, I have never regretted my decision to join in the EMIT investigation. Very soon, it would be apparent to us all why we were all drawn to become involved. I had now joined an expedition to climb an intellectual Mount Everest. Or in my uncle’s words:

Professor William Siri and my aunt Jean.

> “Other mountains share with Everest a history of adventure, glory and tragedy, but only Everest is the highest place on Earth. More than two-thirds of the Earth’s atmosphere lies below its summit, and for an acclimatized man without oxygen, the top of the mountain is more endurable than outer space by only two or three minutes. The primitive, often brutal struggle to reach its top is an irresistible challenge to our

built-in need for adventure.”

The IMIT investigation I had joined was going well. With the full cooperation of DiPietro and Molenaar we were verifying the basic data and results of their research. We were aided immeasurably by the donation of resources by C. Renwick Breck, who provided leased phone lines and servers of InfoMedia Corporation, a Silicon Valley Startup that facilitated virtual conferencing. Thus the IMIT investigation of Cydonia grew out of same fertile soil that was spawning the internet and personal computing revolutions in 1984. Two scientists at SRI (Stanford Research International), Lambert Dolphin, who had specialized in ground penetrating radar studies of the pyramids in Egypt and William Beatty, a staff geologist, were providing sort of a headquarters for the investigation at SRI. The tapes of digital image data were obtained from Goddard and verified, the images on them enlarged and enhanced at yet another Silicon Valley computer company. Thus, the scientific cavalry had arrived at Cydonia. They were not from the government, but a band of wily rebels. Yet, they were heavily armed with scientific talent and resources. I was honored to be riding with them.

It was all there, just as DiPietro and Molenaar had said it was. As recorded in the excellent book ***The Face on Mars,*** by Randy Pozos, the IMIT investigation progressed through several distinct stages, one verifying basic electronic image data of the DiPietro and Molenaar, second expanding the investigation to other objects and areas on Mars, and three, forming hypotheses that could be tested in the future.

We were also aided, incredibly as it seems now, by the generous cooperation of the National Space Research Data Center, a NASA organization, located at Goddard Space Flight Center, who were seemly aware of our investigation and supported it with copies of images and negatives. Jim Riordan, the manager there, was extremely helpful to us. He was helpful for a good reason: as he confided in me on the phone, that half the data requests his center received, concerned Cydonia. He also was an old line NASA employee and longed for the glory days of the Apollo missions to the Moon. He was apparently helping the IMIT group in the hope that we would bring back those days to NASA with a human Mars mission.

The Viking images consisted of 8 bit pixels, with the 8-bit words for each pixel signifying 256 shades of gray, from pitch black to pure white. Roughly a million pixels made up each image, a thousand by a thousand approximately. We had quickly satisfied ourselves that DiPietro and Molenaar had faithfully handled that Viking data. This was easy to see because the face was well resolved, being roughly 50 pixels across, in two images at different times of day. These images were found in two Viking frames, 35A72 and 70A13. Because they had done such a good job presenting their research, we were able, using imaging facilities in Silicon Valley, to quickly verify all their work. The D&M pyramid was also examined carefully by the IMIT group and verified to be well imaged; it was slightly larger than the face, on three Viking frames, 35A72, 70A11, and 70A13. DiPietro and Molenaar had also gone and presented their research at scientific conferences: notably the American Astronomical Society.

At Sandia, I was aided by the Sandia Laboratory Library, which had a copy of the large tome **"The *Scientific Results of the Viking Expedition*"** which was a compilation of scientific papers published after the mission. I began to stay late at Sandia and read the scientific articles in the big book. They were well written and as a scientist, easy for me to understand. I had taken a year-long course in Geology as an undergraduate, and I had greatly enjoyed it. Now that love of Geology returned to me. I was astonished to read in the articles of evidence that water had flowed in rivers on Mars for a long period of geologic time, not just some short interval just after Mars had formed. This was much different than the impression created in me by the popular Mars books. I also had a great resource at Sandia in John McDonnel, a trained geologist who was working as a technician on the pulsed ion fusion project and who had an interest in Mars. It was he who first informed me that the face was in a region of Mars called Cydonia.

The Cydonia region of Mars was the Prime Landing site of the Viking expedition to Mars in 1976, directed by the Jet Propulsion Laboratory.[6] Cydonia had been named by Lowell after a Phoenician colony on ancient Crete, named itself for its association with people from Sidon. The legend was that Cydonia had been founded by a Greek hero named "Cydone." Cydonia was chosen as the Prime Viking landing site because of its geography as a place where water vapor from the North polar cap could

penetrate far south, to near the equator, in the Mare Acidalium depression. Thus Cydonia combining relative warmth and moisture, making a garden spot for any Mars life. The Viking landers were being sent to search for life. However, Cydonia was ruled out for a soft landing as being too rocky and another site in Utopia Planum was chosen instead, which, ironically, turned out to be very rocky. Despite this, a discovery would be made in Cydonia that would make it a covert but powerful engine of Mars science.

On July 25 1976 Dr. Tobias Owen, then a graduate student, discovered the image of the Face in Cydonia on Viking frame 35A72. The picture was taken near local sundown, in order to maximize relief. This image was publicized under the NASA descriptor “Head” at a JPL press conference, and created a sensation, however, the Viking scientists dismissed it a trick of light and shadow. In a pattern of behavior that was to be repeated continually in the following decades, JPL announced that another image was taken a few hours later that showed nothing-a piece of deliberate disinformation because Cydonia would then have been in darkness and no image could be taken. In reality, JPL waited for 30 orbits (roughly 4 weeks) before reimaging the Face in Cydonia, at local early-afternoon lighting, and never announced that a second image had been obtained. This second image, when it was discovered by DiPietro and Molenaar, established two things: 1. That the object was a three dimensional object shaped like a face in a helmet, similar in appearance to an Olmec head on Earth; and, 2. That JPL could no longer be trusted to handle information of such vast implications as the discovery of a possible intelligent artifact on Mars. What has not been appreciated, in fact would be denied by many Mars scientists publically, is the fact that the Face in Cydonia has been a powerful engine driving Mars science ever since. It has done this because the Face is the major clue that Mars’ climate history was mostly Terrestrial, and not Lunar as the mainstream view insists.

The Lunar Mars Model, which assumes Mars has been geologically and biologically dead for most of its geologic history, is still considered the mainstream view of the Mars community. This, despite an avalanche of evidence to the contrary. The origins of this Lunar Mars position, which is even now defended stubbornly, go back to the 1960’s and the first images of the surface of Mars from Mariner 4 which showed no Lowellian canals, but instead craters on a barren Moonlike surface. The hard eyed ‘Young Turks’

of Mars in the 60's science considered the Lunar Mars concept to be a triumph of science. Bare lifeless rock was their concept of Mars. Armed a few years later with radiometrically dated Moon rocks from the Apollo program, the Lunar Cratering Chronology, used to date terrains by counting crater densities on the Moon, was extended to Mars. It assumed a Lunar cratering rate on Mars' surface and recovered a Lunar age of 4.5 Billion years for the heavily cratered south half of the planet. Never mind that Mars was close by the asteroid belt, the source of most impacting bodies, and thus would have a much high cratering rate than the Moon, and never mind the smooth lightly cratered plains in the north that looked almost terrestrial. No, these were simply annoying details. Therefore, the Lunar Mars Model, buttressed by the Lunar Cratering Chronology, became the mainstream position and anyone who disagreed was dismissed as a 'gondolier of the canals of Lowell.' But that was 40 years, and a mountain of contrary Mars data ago. Why is the Lunar Mars Model, and its chronology, still the mainstream position? The answer lies, in the author's opinion, primarily in the "geo-bio-centric" view of the human race, a species known for its stubbornness. But also the Lunar Mars model is deeply anchored in the conflicts within the American space program.

Since the origins of the United States Space program, tensions have existed between the human spaceflight program and the robotic one. JPL, in charge of the lunar scouting probes for the Apollo program, had even insisted that the Moon could be better investigated without astronauts, and at far less expense. But as everyone knows, if humans are to become spacefaring, humans must go into space. That is our destiny, seen amply advanced by the Apollo missions to the Moon. Mars however, was much farther and more exotic than the Moon, and was a prize to be guarded for robotic exploration far more forcefully. This put JPL in a dilemma, for to find anything suggesting life on Mars, much less the remains of a dead civilization, would be to hasten a human mission to Mars. This would mean the transfer of control of Mars, an endlessly fascinating place, from Pasadena to Houston. Thus the bright dream of Tsiolkovsky, Goddard, Korelev, and Von Braun, loomed like a dark specter over JPL, and would doom their plans for a leisurely and scholarly robotic exploration of Mars. In the words of one sci-fi writer familiar with the political tensions with the U.S. Space Program: "life

on Mars is death for JPL" So when the dark visage of Cydonia stared back at Mars scientists in 1976, the battle lines were immediately drawn in Cydonia on Mars, the planet of war.

The "Lunar Mars Model", the concept that Mars was, like the Moon, a biologically and geologically dead world from its early history, had become the fortified position of JPL, and by extension the whole robotic science community. This view insisted that the surface of Mars, even in the younger north, was very old geologically and any water channels seen had dried up Billions of years ago. Thus, the leadership of JPL viewed the face in Cydonia as an unspeakable annoyance. They not only did not believe the face of Cydonia might be evidence of a dead civilization, they ***could not believe it.*** For Mars was Lunar, it had always been. But this view was soon besieged by the spirit of human curiosity and the avalanche of the Viking Mars data, ironically the fruit of JPL's own skilled labor.

Vincent DiPietro and Gregory Molenaar, who were two image processing experts working at NASA's Goddard Space Flight Center, far from JPL, seized on the discovery frame of the face in Cydonia and obtained it in electronic form and enhanced it. They also discovered the second image of the face in Cydonia on Viking frame 70A13, taken 35 orbits (roughly a month) after the original image was taken. However, when they ordered the tape of the data storing the new 70A13 image, JPL refused to send it. Finally, only the threat of a Congressional inquiry would cause the tape to appear. When it finally arrived and was enhanced and the two images of the face compared, the results were stunning. The face in Cydonia appeared to be a symmetric carved face in a helmet. They also discovered a pyramid like object on three frames, within 5km of the face. When DiPietro and Molenaar began to publish these results there was great interest, but also the usual reaction that what they had found was simply an "Old Man of the Mountain" on Mars, to which they responded the "Old Man "was merely a profile, while they had found a complete face. However, more serious trouble erupted where they worked.

DiPietro and Molenaar were charged by NASA with misuse of government property, but their supervisors spoke up for them, and it became a battle between factions within NASA. DiPietro and Molenaar wanted a human

mission to Mars and felt investigating Cydonia would hasten it. Others did not want this subject even broached. Cydonia and the implications of its appearance, for Mars climate, and for the human place in the cosmos, became unspeakable within the robotic Mars science community.

So the whole story was now seen by me. Vince and Gregg were two rebels fighting the robotic science community, who had their own agenda for Mars. As a veteran of real science and large projects and institutional science, I understood their position, and as someone trying to do good science for the nation in the face of personal rivalry and managerial egos, I identified with both of them. I was getting a rough education in “real science” at Sandia, my first job out of school.

Things were now going my way finally at Sandia. Computer simulations of the fire-hose instability, ironically performed by the same senior scientist who disliked me, had shown my model to be basically correct. I had seized on this and produced a sophisticated mathematical model that mimicked the computer simulations. The rotation of the beams induced a ‘Coriolis Force’ term that smoothed out the instability to a degree and lowered its violence. Apparently, the slight lowering of the level of instability in the simple mathematical models was amplified into a dramatic stabilization in real life experiments, where many other complicated processes were occurring at once. The electron beam was no longer afraid of its own reflection as it moved through the air. So I was being proved a brilliant physicist after all. This gave me the confidence I need to attack the problem of Mars. To help matters further, E.P. Lee, the most brilliant electron beam theorist in the country, was now working with me to produce a theoretical article for publication in a major science journal. To my colleagues at Sandia, it seemed like I had achieved a wonderful success. However, I knew my seeming defiance of upper management was proving to be a major problem. If I had been proved wrong, I could have been forgiven, but instead I had been proved right. In fact it would turn out I had underestimated the degree of fury I had unleashed in upper management by saving the project. The place had a different culture than I was used to.

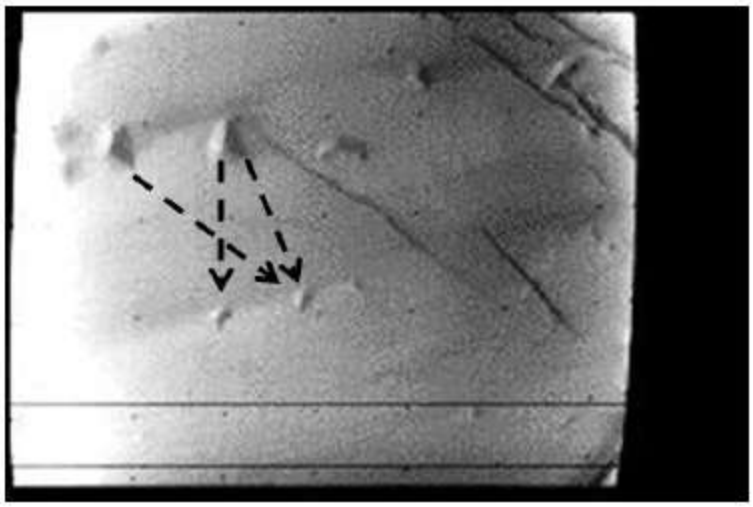
I had remembered a year before, walking down the hall one beautiful morning at Sandia, with the roar of jet fighters overhead, and seeing bright

rainbows of color dancing on the walls of the hallway of offices. The rainbows were coming from a small piece of carved glass hung in the office window in a corner office. It was the office of a new scientist like me, fresh out of school. Only I was already a battle scarred veteran of the place, having been there a year and half. The fellow had his corner office door wide open and was sharing his rainbows with whole hall. I remember thinking *'that guy isn't going to last here, he doesn't understand this place.'* I was proved correct; he left after only six months. In general, the place was much different than Livermore. At Livermore, it was common for scientists to adorn their office doors with cartoons and unintentionally humorous news stories or interesting scientific articles. Here at Sandia management would prowl the halls after hours and rip down anything found posted on doors, leaving it on the floor. One morning I came in early and found notes on two of my colleagues' office doors. Both unsigned notes read "clean up this office you PIG!" I took down the notes and left them on my colleagues' desks so they would see them when they came in. When I saw my two colleagues later, I told them about what I had found. Both just shrugged, saying that posting abusive anonymous notes on doors at night was part of part of "Standard Operating Procedure" at Sandia. One woman scientist, overhearing this conversation, expressed puzzlement. "This is peculiar. The person who normally does this is posted to Washington DC!" she laughed, then went back to her office. I became extra careful to keep my office neat and clean after that incident. I had also discovered that I was the third person to occupy the position of junior electron beam theorist on the project, the previous two transferring to other projects after a year each. So I was the third 120 Volt bulb, screwed in to what was apparently a 480 Volt socket. However, I also knew that my brash manner had offended others before, so I continually felt that I had helped to create the situation I was in at Sandia. I knew I had made mistakes. My hope was that my article with E.P. Lee as coauthor would overwhelm any annoyance in upper management and be accepted as my sincere apology. So I charged on, convinced that pure science accomplishment would save me.

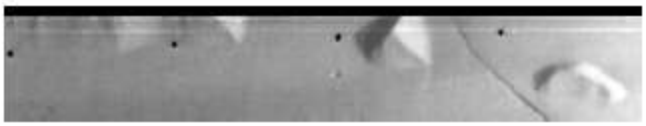
The IMIT group was now expanding its analysis to other objects in the vicinity of the face in Cydonia Mensa (Cydonia mesas) as the small region of the face was named. I was concentrating on finding every usable image of the

face, even it was of a much lower resolution. Looking through an image catalog provided by Goddard, I was locating a sequence of low resolution but still useful images of the face and passing them on to the IMIT team, these were 753A33 and 34, and 673B54 and 56. Many of these had also been found by DiPietro and Molenaar, but they had concentrated their limited resources on 35A72 and 70A13, the high resolution images. Now, acting a ‘chief obtainer of images’ for the IMIT team, I was ordering negatives of the low resolution shots and enlarging them, trying to gain the deepest insight possible to the three dimensional structure of the face. As with any three dimensional object, every new observation angle and every new illumination condition provided valuable new data on its real shape. We also looked at other images suggesting archeology from other areas of Mars.

We looked at the pyramids of Elysium and discovered a second image had been taken. The second image had been apparently taken with great difficulty, given the primitive nature of the Mariner 9 spacecraft cameras and the poor knowledge of the Mars gravity field. Whereas the well-known image of the Pyramids of Elysium showed them at sunset, the new image, which barely captured them, showed them at morning, and confirmed their pyramidal shape. The second image confirmed something else also, it confirmed that the US government had investigated the pyramids, and thus the second image series taken over Cydonia was part of a pattern of government behavior. Despite their public poo-pooing of the objects’ archeological appearances, the government was privately seeking more image data on them. However, the images had been left in the public data files – so no attempt at covering them up was being attempted. It was as if the government either found the images uninteresting or wanted us to investigate.

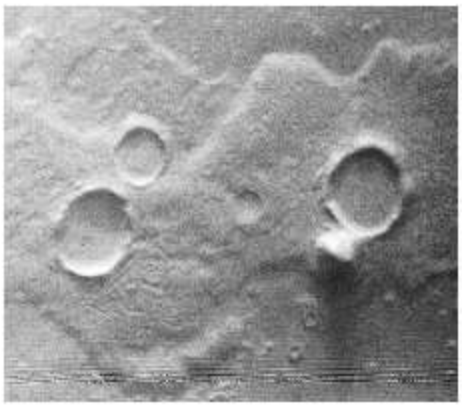


The Pyramids of Elysium, imaged by Mariner 9 at local sunset. Dashed lines indicate alignments of pyramid vertices with small mounds.



Second image of the Pyramids of Elysium by Mariner 9 at sunrise.

Despite finding other areas of Mars showing what looked like archeology, we ended up focusing on Cydonia because its data base was more extensive and had the highest concentration of interesting objects. A saying, attributed to Richard Hoagland circulated: “The case is made in Cydonia.”



The Crater Pyramid near Deuteronilus Mensa from Viking frame 43A34. Note linear features nearby

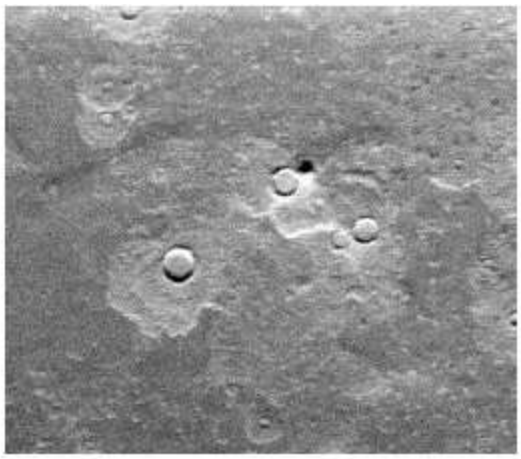


Image of "Crater Pyramid " casting a shadow, from Viking frame 675B53, showing that the object completely dominates the surrounding terrain for many miles

The double high resolution imaging coverage at Cydonia Mensa, yielding frames 35A72 and 70A13, and being left in the public record, probably made the Cydonian Investigation possible. A single image of the Face at high resolution would probably have been too easy to dismiss as a "trick of light and shadow." No serious scientist or engineer would have risked his reputation over such a slim piece of data, so at variance with mainstream science. However, two high resolution images, each taken under different lighting conditions, both showing the same Face in a helmet, excited the imaginations of our bold group, and we pursued our investigation relentlessly. We were rebels of the most serious sort, breaking with

mainstream scientific thought, which unfortunately had the human race marching lockstep to the brow of a nuclear cliff. It was an act of glorious rebellion.

The Face was oriented approximately north-south on Mars, and both 35A72 and 70A13 were taken in the afternoon so that only the western portion of the face was fully illuminated. In 70A13, taken in early afternoon, portions of the “dark side of the face” could be seen dimly, and contrast enhancement seemed to show the face was symmetrical and framed by a symmetrical helmet. But I was not satisfied. 673B54 and 56 showed the face as 15 pixels across, roughly, but they were taken at the same afternoon conditions as 70A13 and showed the same image, howbeit at lower resolution. Still, it was data. It certainly looked like a fuzzy face in a helmet, just like 70A13. However, I discovered 753A33 and 34, showed the face as roughly ten pixels across, a low resolution, but they showed it in morning-light. I became obsessed with obtaining these images. I ordered them from Goddard and asked for enlargement of the bottom center third of the image, which contained the face.

On the church front, my wife had been working through legal channels with members of our church and had gotten an illegal immigrant from Nicaragua, Roberto, sponsored out of detention. Roberto was an exceptionally well behaved and disciplined young man, who had fled induction into the Communist Army of the Sandinistas, for their war in the jungle against the U.S. backed “Contras.” He was now our houseguest and stayed in our guestroom. The wars in Nicaragua and El Salvador were leading many people to flee their homes and come to the United States seeking safety. It did not matter to the Reagan administration that these people were fleeing the communist secret police in Nicaragua or the right wing death squads of El Salvador, all illegal aliens from south of the border were treated the same. They were put on an airliner back to their home countries. Such was the confused politics of the times, that the Reagan administration was ready to ship Roberto back to Nicaragua, to the waiting arms of the Sandinista secret police, while some liberals in our church complained about our good treatment of a “draft dodger” from a socialist state. These same liberals kept showing up to our “Peacemaking” meetings and producing a deadlock over wording of our proposed “No First Use”

resolution for the Presbyterian General Assembly. We had hoped to get our church council to endorse it, and thus forward it to the U.S. headquarters of the church so it could be offered for a vote at the yearly national church convention. The U.S. was threatening to use tactical nuclear weapons to stop the Soviet and East German tank divisions poised on the NATO frontiers. This had saved the U.S. the expense and controversy of stationing large U.S. field Armies in West Germany. The problem was that this would make a conventional invasion of Western Europe by the Warsaw Pact turn into a global nuclear war within hours. But according to the pretzel logic of the times, this was not considered a problem in the minds of those setting policy.

To prevent the possibility of global nuclear war over West Germany, like what had nearly happened in November 1983, we Peacemakers, following the suggestion of seasoned foreign policy experts McGeorge Bundy and others, proposing that we reinforce our armies in Europe, while also declaring a “no first use” of nuclear weapons. To the strict pacifists in our congregation however, no reinforcement or even preparation of increased defense was acceptable. They insisted that the world had far too many weapons already, an understandable emotion, even it if made no sense. We were of two different worlds, sharing the same planet. The meetings deadlocked between the defense workers who desired peace like myself, but recognized its requirements, and others who wanted disarmament, even if it was unilateral. Still, we would not give up, and continued our weekly meetings and their dialogues, trying heroically to find a middle path. We Peacemakers were going the ‘extra mile’ with each other, or maybe two or three.

While I waited for the enlargements and negatives of 753A33 and 34 to arrive, believing them to be crucial. Several things happened while I waited for them. I was down at the Sandia Library standing in line by the copy machine in the early evening, waiting to copy yet another section of the Scientific Results of Viking book. A fellow next to me found my book interesting as he waited also. I explained to him that the atmosphere of Mars had very peculiar patterns of nuclear isotopes of oxygen and nitrogen, compared to Earth, indicating possible past conditions like Earth. This isotope question had been a line of inquiry started first by DiPietro and Molenaar, to see if Mars had been more like Earth in the past. The fellow, as it turns out, was a nuclear physicist and an expert on monitoring the Earth’s

atmosphere for covert nuclear tests. This was a large program at Sandia, I knew, and was to prevent the spread of nuclear weapons by detecting even secret nuclear tests by rogue countries. I remember distinctly that night had fallen outside, being that it was winter, and even in the library many lights had been turned out. Still I remember the fellow's round genial face and white shirt. Then I mentioned the isotopes of xenon, a heavy noble gas found in Earth's atmosphere and used in strobe lights. The pattern of relative isotope abundances of xenon on Mars were bizarre compared to Earth, the Solar wind, and the meteorite gases people had used for comparison. The numbers had jumped off the page because they were so different than Earth. In particular xenon 129 was superabundant in the Mars atmosphere, compared to other isotopes, I mentioned. He looked at me in sudden astonishment, his smile vanishing.

"Can I see that?" he asked, and I handed him the book open to the page with a table of atmospheric isotope concentrations, since I was about to copy it. He frowned deeply, and then looked very troubled.

"Somebody nuked them," he said suddenly. "That's what the Xenon 129 super-abundance means." The words pierced my soul like a blade of ice. He handed back the book and stared at me wordlessly, letting the words sink in. Looking deeply troubled and in thought, he then set down his own book and walked away, out of the library and down the darkened hallway. I knew that reaction. It meant he had caught himself talking about something classified in an unclassified area, and was excusing himself. A deep chill ran through me. The images of Mars with craters everywhere had always given the impression of a desolate war zone, but I had blocked it out, considering that all the craters were natural. Now I felt suddenly sick. Nothing in the images we had seen, suggested anything more than a Bronze or Late Stone Age Civilization on Mars. The possibility of a nuclear holocaust, so threatening on Earth, seemed remote on Mars. Now I wondered, had we misjudged the level of technology? But the impression remained of a primitive civilization, incapable of building highways, much less nuclear weapons. I quickly copied the article on isotopes and left the building out into the cold night and drove home quickly. Sadness overwhelmed me as I sat down and my wife gave me some dinner. She sensed I was distraught, but I did not want to talk about what I had just heard. I spared her.

“A bad day at work?” she asked gently. I nodded and tried to muster a smile.

“Yes, but Ed Lee and I, we have this fire-hose theory thing in good shape. I think I may get a bonus for it.” I said bravely. Roberto arrived home from his job at a warehouse. He was a good fellow and soon we were all happily drinking coffee in my warm house and my wife served him dinner also. He would get an apartment soon, since his brother, who was fleeing recruitment from both the Sandinista Army and the Contras as well, had been sponsored out of detention by a Catholic congregation in town and the two brothers were going to be reunited. It was a happy ending, or at least a happy beginning. God had looked out for both of them and saved them from certain death in a savage war zone, I knew God would look out for us also.

I called Lambert Dolphin at SRI later that evening when everyone had gone to bed, and shared the strange report. My feeling of intense cold returned as I spoke of the xenon 129 anomaly. He was astonished and began muttering helplessly about the antichrist and the end-times.

“Is it possible we are not looking at Mars, but at Earth a hundred years from now?” Lambert gasped after regaining his composure, implying that Mars looked like Earth would look, after a nuclear war had wiped out all life. The Sphinx and pyramids would be left in Egypt, if that happened, as a mute testimony that Earth had once been the dwelling place of life, intelligence, and also mindless hatred. Lambert calmed himself and thanked me for the report, which he shared discretely within the group. As he hung up I noted a strange sound on the phone line, almost like an echo chamber. I had noted it previously when speaking to him or Richard Hoagland in California. I decided not to think about it and went to bed.

The next morning I was back in my boss’s office. He regarded me with his same poker face, like the stone face on Mars. His eyes were cold. It must be known that I liked and respected my boss. We had had many amiable chats before the troubles began, and I admired his hard-nosed professionalism and scientific skill. I even liked his seemingly unflappable poker face, despite what was happening. He was a good man, I knew, but now in a difficult position.

“You’re taking too long writing this article with Ed Lee. You have to wrap this up and submit it to a journal.” he said, bluntly.

“Yes, but Ed keeps wanting to make changes. This is entirely a new theory; he wants to get it right.” I replied. *Oh no,* I thought. *They have me now, I can’t rush this article.* My boss was silent, then said in frustration.

“All right, but you have to finish the article soon. Do you understand, Brandenburg?” I sensed he was under pressure from upper management to find some fault in me, even after my theoretical accomplishment.

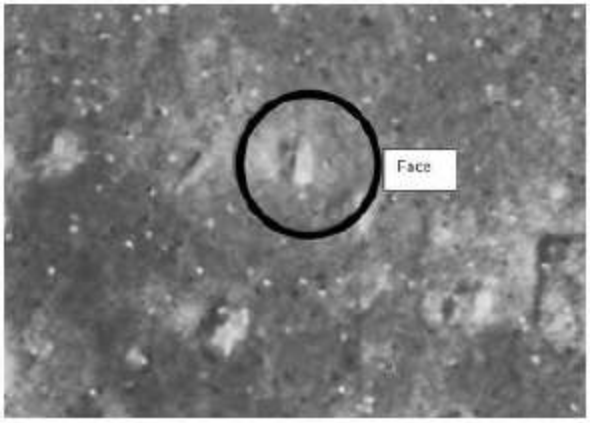
Ed Lee and I had known each other for many years and had shared the same office area at Livermore. He was everything I wanted to be as a physicist, scholarly, brilliant, and practical. I trusted Ed Lee’s judgment far better than anyone I worked with at Sandia. Ed and I were going boldly into electron beam theory where no man had gone before, and we were writing the article and revising the theory at the same time. Ed wanted to get it right the first time. I agreed. But we were being rushed. We had also made the disconcerting but no less wonderful discovery that the spinning beam electron fire-hose problem involved three modes, not two. The modes were helical, like corkscrews, unlike the simply side to side thrashing of the non-spinning beam. Ed and I were delighted by this development, being physicists, but to the engineering oriented management at Sandia, this was an infernal complication. My boss had received the news of the discovery of an extra mode of fire-hose instability with a vacant stare. When I suggested that we could write a celebratory memo about the discovery, he had simply shaken his head. Looking back on it, I think I was doomed already, but it is possible that the third mode of fire-hose had actually saved my job for several months. But at the time, I was fixated on the hope that this great theoretical development of spinning fire-hose theory, which would help the program to be successful, would allow me to remain at Sandia in Albuquerque and establish me there.

The next day I heard my boss arguing with a colleague in the office next to me. My boss started screaming hysterically at someone. He was losing it completely. I froze. Finally he calmed down and I heard him leave the office. I felt badly. My boss was obviously under tremendous pressure, probably because of me.

The IMIT investigation was now dividing into different subgroups, some like me were concentrated on *Objects*, and others like Richard Hoagland were looking for geometric arrangements of the objects, *Alignments,* like the arrangement of the monuments and buildings on the U.S. Capitol Mall or at Stonehenge. Both of these lines of inquiry had great validity, but in the fast moving IMIT investigation, it also looked like the group was losing focus. In my conversations with Lambert Dolphin, which I held-offline rather than typing, I floated the idea that we should present a paper at the upcoming **Case for Mars II Conference,** to give the EMIT group more focus. He liked the idea. I noticed again the phone sounded weird when I would talk to him.

Roberto moved out to join his brother in an apartment, and when he departed, it seemed that a sense of comity in the house departed with him. Now my wife and I could fight after Elizabeth went to bed and no one would hear. I told her I wanted to leave Sandia and go someplace else; she was devastated, having fallen in love with Albuquerque. But we tried to keep things together; it was all we could do.

The enlargements of 753A33 and 753A34 arrived, together with the negatives. They arrived at work at a post office box I had rented on the Kirtland Base, near my office. I examined the images of the face, illuminated at local dawn in Cydonia in my office with a magnifying glass. They both showed Cydonia as it appeared at dawn. I located the face carefully by triangulating its location from larger landmarks in the area. I now knew the region like the back of my hand. I had wandered it in my dreams for months. I saw that the face, even though at low resolution of only ten pixels across, appeared left-right symmetric. I began to shake after studying this and was overcome with emotion and broke down and cried like a child in the solitude of my office. Mars seemed to me at that moment like Alderann in ***Star Wars,*** a helpless primitive planet, destroyed by powers beyond its comprehension.



Enlarged image of 753A33 , showing Face at dawn on Mars

Portion of 35A72 showing same area as 753A33

"They blew the whole thing up! The bastards blew it all up…" I heard myself sobbing. I quickly regained control of myself. I studied the face images from both frames as carefully and objectively as I could, wiping my eyes. I blamed my breakdown on the emotion strain I was under, but I realized that some deep part of me had already reached a conclusion about Mars and Cydonia after seeing the image. The image was low-resolution, but as I studied it carefully, I became convinced that it confirmed the basic left-right symmetry of the Face suggested by 70A13. I also studied the other image, 753A34, and also seemed to confirm symmetry, but its contrast was not as good as 753A33. The face in these images looked like a low resolution shot of a symmetrical face in a helmet looking up at the sky. With this last frame 753A33, we had exhausted our supply of useful Viking data. We now had all the data that we would have-until another space-probe was sent to Mars. After frames 753A33 and 34 had circulated, and the face was definitively located by everyone on 753A33, people began to volunteer their

judgment on the probability that the objects in Cydonia were artificial.

Finally, one night on the modem-terminal I gave the rest of the IMIT my verdict on the face and other objects. I pointed out that we now had obtained all the basic image data available on the face and that if people had not formed an opinion by now, they basically would not form one. I then gave my opinion.

I said that, based on the evidence of extensive water erosion of Mars' surface, which required a dense Earthlike atmosphere for a long period, the high oxidation of the surface and apparently the exposed sediments in the Vallis Marinaris, consistent with an oxygen rich atmosphere produced by photosynthesis, and the evidence that the face was a symmetric carved artifact, from study of all the images, including 753A33, that I had concluded that the face and pyramid were artificial. I also added that if all life on Earth died, studies had shown that Earth would look like Mars in a few million years.

Over the next couple nights, the rest of the people in the IMIT conference then volunteered their own opinions, most of them agreeing with my basic opinion that the face was artificial. We had basically completed our investigation as far as I was concerned. We had investigated the data found by Dipietro and Molenaar and had validated it, we had looked at the whole of the Viking mars data also, and concluded that a past Earthlike period on Mars had existed. It had been successful. We discussed details of what course of action or presentation we should make as our next step.

It was proposed to the IMIT group that we submit an abstract to the Case for Mars II meeting in July in Boulder Colorado. This idea got everyone enthused and I was put in charge of writing the abstract. This was a difficult task since the investigation was going in so many directions now. It was difficult to make everyone happy and still write an abstract that would be accepted by the conference.

We were fortunate in one respect; I was authorized to make a trip out to the San Francisco bay area to meet with Ed Lee to finalize our theoretical models. We had made enormous progress, and it seemed the best way to finalize the theory so we could finish the article with as few last minute

changes as possible. We now were both certain we had made a breakthrough in electron beam-hose theory.

I managed to fly out early and meet with Ed at his office in San Jose. Both of us standing in front of a chalkboard finally agreed on the many details of the model, and we were set to go. I then left for the flight home to Albuquerque and managed to stop by SRI in Palo Alto for a brief meeting with everyone in the IMIT effort, about twenty people, at the “Mars Room” at SRI. It was a wonderful meeting, and we briefly discussed the abstract and paper we hoped to present at the Case for Mars Meeting.

When I returned home my wife was distraught. The FBI had moved through Albuquerque and arrested several people in the sanctuary movement, including one of her friends named Clara from the Catholic Church nearby. The local Catholic congregations, unlike the Presbyterians, had not followed the legal niceties of sponsoring people already detained by the government. The Catholics, deeply involved in the Hispanic community in Albuquerque, including several local priests, had given shelter and hiding places to people who had come straight across the border.

“I knew something was wrong,” my wife said tearfully, “because when I would call Clara her phone would sound funny, like an echo chamber. It was obviously being tapped!” The words struck me like an electric shock. Suddenly I knew I and my IMIT colleagues were also under surveillance, our phone lines had been tapped also. I had suspected this and felt it, but dismissed it as paranoia. Now I knew: a dead civilization on Mars and the means of its demise was considered a national security matter.

Fortunately, my wife was not involved in anything illegal, and Roberto and his brother were safe, sound, and legally situated.

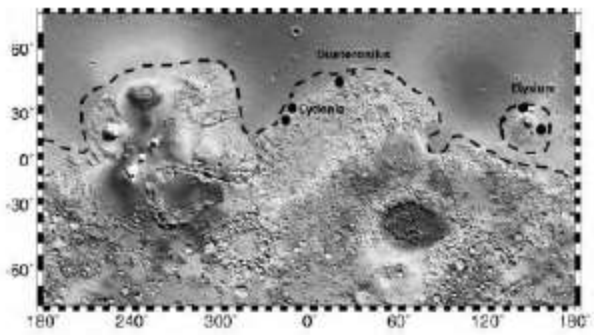
Ed and my rotating fire-hose theory was presented at a conference in Monterey, California, in June, and well received. We had done it. Now we had to simply finalize the theory and get it into a journal. At no time was it suggested that the rotating fire-hose theory or its stabilizing effects on the electron beams were classified. It was simply considered a “nice piece of physics” as one of my fellow beam theorists said. Others had been finding similar results using computer simulations. I began to work on space

propagation of beam weapons. I was feeling invincible as a scientist, despite whatever management at Sandia felt about me. I was a scientist and my job was to do science in the service of humanity. And I was doing it.

Our abstract was accepted for the Case for Mars II with some minor internal squabbling within IMIT over the emphasis of "objects or alignments."[8] I flew up to Boulder, Vince met me there, and we prepared to present the IMIT paper in a mixed format of showing the results as a poster and giving twenty minute oral summaries. Richard Hoagland also attended. Here at the conference were the elite of Mars science remaining after Viking. They were the Mars Underground, a group determined to keep investigating Mars even after the negative life results of the Vikings. Many other planetary scientists had moved on, along with the grant money, to the outer Solar system and the moons Europa at Jupiter and Titan at Saturn, now seeming like most likely places to find life. But the Mars Underground still believed in Mars' future.

I was filled with pride. In a superb bit of "guerrilla science" the IMIT team had investigated the work of DiPietro and Molenaar of Mars science, verified it, and here we were dutifully reporting our findings at the seminal 1984 Case for Mars conference in Boulder, Colorado. I had the honor of presenting the IMIT report, and the effect on assembled Mars scientists was electric. It seemed to rally the Mars science community, who had been devastated by the negative results of the 1976 Viking life experiments. It suggested Earthlike conditions and life on ancient Mars. The thought-virus of the artifacts at Cydonia and our accompanying picture of a Terrestrial Mars climatic history were planted deeply. To the assembled Mars scientists we presented not only the face and pyramid but a whole range of objects in an arc across the north from Cydonia to Elysium and a concept of Mars past climate that was very Earthlike for most of its history. Cydonia appeared to be part of a pattern of archeology, a crescent running from Cydonia to Elysium, and also part of pattern of past climate. That pattern was all concentrated near old water channels and slightly above the "Martian sea level" - a 0 km elevation line that stretched around the planet in the north. I commented that this 0 km line appeared to be the shoreline of an ancient ocean. I noticed one character with long brown hair in the audience grinning 'ear-to-ear' at this presentation. In general, most of the audience seemed be spellbound and pleased. The idea of

Mars' past climate as Terrestrial was planted deep in the audience.



The Cydonia-Elysium Crescent on Mars presented by the IMIT

I was giving the talk for IMIT, summarizing our findings.[9] Everyone seemed mesmerized and I felt like I was surfing the wave of destiny. I felt like the young-hero scientist in some 1050's sci-fi movie who saves the world. One white haired scientist, whose name-tag read Von Putenkammer from NASA HQ, glared at me during my talk, providing me some comic relief. I merely grinned broadly back at him and proceeded to deliver the talk as if he was the only person standing there. I was thinking, *You can't out-Prussian me, Jack! My name is Von Brandenburg and I just solved the riddle of rotating electron beam hose!* Despite this, almost everyone seemed pleased with our paper except the author of the poster paper next to us. He was obviously also angry at our paper, probably because it was getting more attention than his. He was advertising his new Mars camera. He would speak at the same time I did, and try to shout over me. I was on a roll, and I merely talked louder myself. This went on all morning. I finally asked Vince, who was watching all this with amusement: "Who is that prickly SOB?" Vince replied that his name was Michael Malin, and as it turned out, he and his camera would factor deeply in the future of the Cydonia investigation. Another fellow, Steve Squires, later in charge of several Mars rovers, seemed to like our paper and suggested we speak to Carl Sagan about his own published searches for civilization on Mars. This seemed like a good idea.

I returned home on an airliner at the end of the day. I was glowing with satisfaction; my wife noticed my calm happiness and seemed filled with joy.

It had been hard for her: my new job, the intensified Cold War, the sanctuary movement, Mars. Now, it seemed like the whole Mars episode, at least, had reached a happy conclusion.

That night I dreamed I was on Mars in the future. In the dream the human race had come to Mars in force. Everywhere ruins were being rebuilt and restored by teams of astronauts and archeologists in a massive project. There were great stone lions; there was an avenue of sphinxes and pyramids. I awoke the next morning with tears in my eyes. I knew what the dream meant in a prophetic sense. It meant the IMIT investigation had somehow saved the human race. That dream comforted me during the aftermath of the IMIT paper.

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Chapter 3 The Sea Change

I had returned from the Case for Mars II conference, had thrown myself back into work, and was staying late one night at the office when a knock came on my door. It was my poker faced boss, come to fetch me for an inquisition. In another supervisor's office a long list of charges was read before me, including having a messy office, talking too much and other similar 'chicken-shit.' One of the prominent charges was "making too many changes to my theoretical manuscript with Ed Lee." I protested that Ed had wanted the changes, and he was my coauthor. The presiding supervisor turned to my poker faced boss and asked,

"Did you give Brandenburg permission to incorporate these changes that Ed Lee wanted?"

To my amazement my boss said "No." I was astonished. He was lying. We had discussed Ed's changes several times, and my boss had reluctantly OK'ed all of them. All desire to remain at Sandia fled from me in that moment. I was forced to choose in that minute, whether to call my boss out as a liar, someone I still regarded with affection, or simply accept that upper management wanted to be rid of me and nothing could change that. I chose to hit the ejection button.

One of the other supervisors on the project, a good fellow named Bruce, exclaimed to me,

"Aren't you going to defend yourself!?"

I shook my head. I was done with Sandia. I turned to the presiding supervisor, who looked very sad and said. "I'll tell you what, I will resign in three months, but I need that long to find a new job." This was accepted. They wanted no more trouble with me, and they also knew the rest of the regular staff thought I was a hero. They wanted me to go quietly. I just wanted to go, go as far from the place as possible. I had made many mistakes and had learned much at Sandia. I had learned science was a business, a professional vocation, not just a holy quest for truth. If I was to succeed as a

scientist, I would have to master its business aspect.

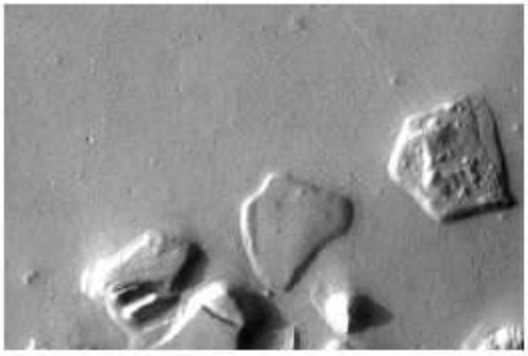
The following three months passed quietly. It was over. I was a just a ghost, now haunting the place for a little while longer. Now, I just needed to find a new job, sell my house and move to a new city, my fortunes in Albuquerque having been spoiled. I finished and submitted the fateful fire-hose theory article to a journal. Finally our peacemaking group, by a seeming miracle, agreed one night on the wording for our “no-first-use” resolution. It was submitted to the next church council meeting for approval to be sent to the Presbyterian General Assembly.

However, our pastor approached me just before the church council meeting and pleaded with me to withdraw our ‘no first use resolution’. He said the resolution would probably pass, but many conservative members of the church were threatening to leave when that happened. Not wishing to split the church congregation I loved, I stood at the beginning of the council session and asked that the resolution, the result of so many arduous meetings, be withdrawn. It was withdrawn before the vote and the crisis passed. Some of the liberal members of the Peacemaking group were outraged at my action, but the defense people understood and agreed that withdrawing the motion was best. I understood both viewpoints. I felt the process had been important. I learned from this process that some ideas can seem eminently reasonable to one group of people and be considered utterly unacceptable to others.

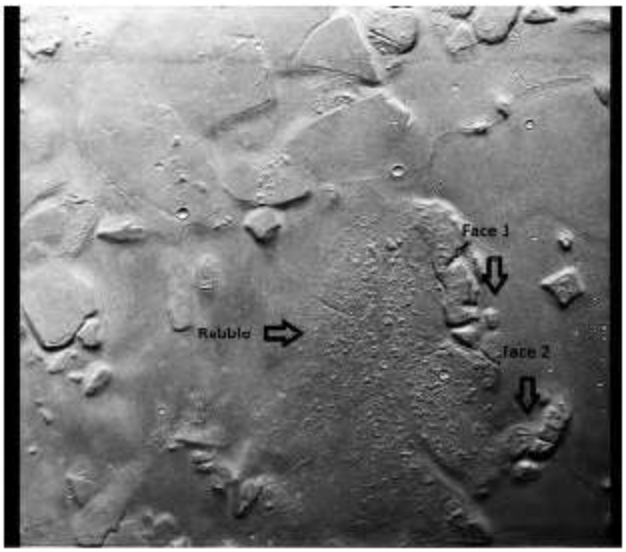
I had ordered some more pictures from Mars, sight-unseen, of a site similar to Cydonia; it was next to Utopia Planum, on the old sea shore. I was looking for high resolution images from a region just above the 0 km elevation line, near an old river bed, and on local high ground. This was a “archeological site model” for Mars. Using the photomosaic maps in the ***Atlas of Mars,*** I found a series of images, the 86A series, over such a site and ordered them ‘sight unseen.’ The images arrived; I was laying them down in my living room one morning, 8x10 after 8x10. Suddenly, I began to see what looked like structures and ruins similar to Cydonia. There were smooth mesas near what had obviously been the sea shore, then uddenly the smooth topped mesas were covered with fine rubble. I began to shake with excitement. The site model had worked! Then - almost as if an angel was leaning over my shoulder saying ‘look down! look down now!’ I looked down carefully, at

Viking frame 86A10, and saw what looked like rubble of a city, and beside it two faces like the face in Cydonia. [1] They were about 2/3rds the size of the original face. I examined them closely; they had marks on the cheeks and a mark above the left eye similar to the face in Cydonia. One looked very similar to the Face in Cydonia, a face in a helmet, the other face looked like it had much less relief. It was sort of a two dimensional face etched into the surface. I took them to a commercial photo-lab and had slides and blowups made. Other interesting features were found on the adjoining frames.

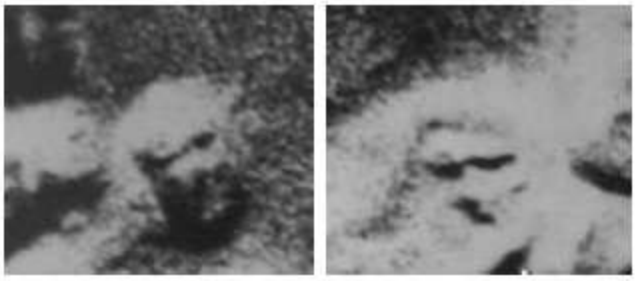
Linear feature in Utopia region for Viking frame 86A08



Mesa with rubble on top of it from Utopia



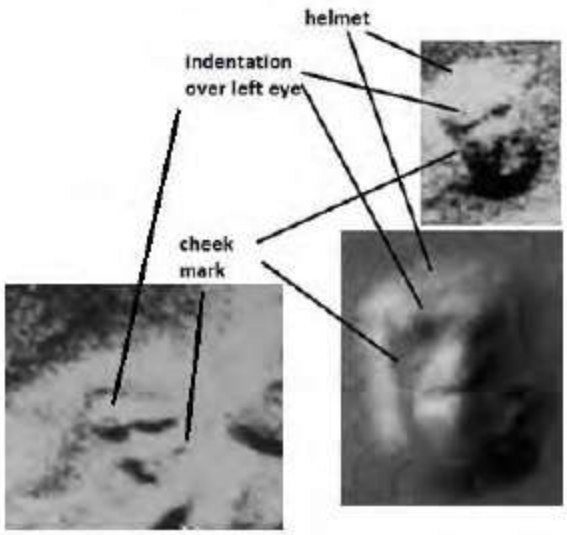
Frame 86A10 showing the apparent rubble of a city and two faces



The two faces found in Utopia , approximately 2/3 the size of the face in Cydonia

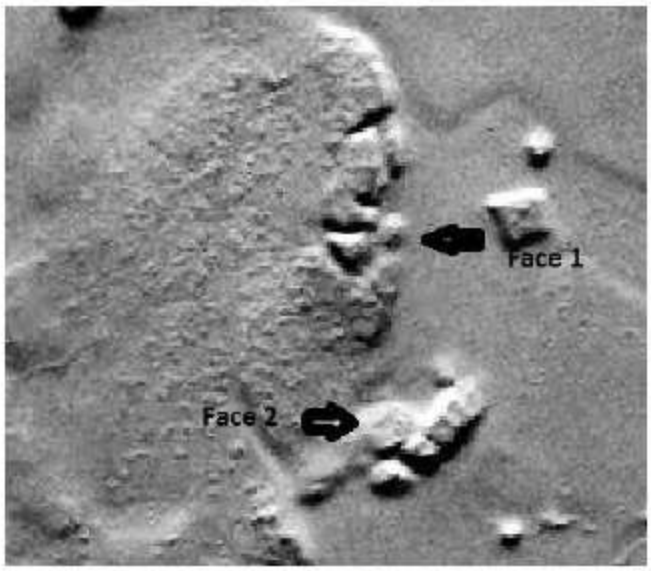
While I was ghost, a Mars researcher named Hal Masursky, arrived at Sandia to give a talk and I joined him for lunch afterward. He had been the researcher who grinned ear-to-ear at our Case for Mars II paper. He commented:

“We didn’t know what to think of your Mars face pictures, but we really like your Mars ocean. Why don’t you present a paper just of the Mars ocean separately?” I promised him I would try, even though I had no idea where I would be in a few months. I showed him the Utopia faces and pointed out there similarities in detail to the face in Cydonia. He was transfixed.



Comparison of Face 1 and 2 in Utopia with the Face in Cydonia. Besides overall structure of eyes, nose, and mouth, other ornamental details such as cheek marks, and an indentation over the left eye are visible. Face 2 appears more two-dimensional than Face 1

In the following weeks I repeated the procedure I had followed at Cydonia, by obtaining every possible image of the Faces in Utopia. I found two moderate resolution Viking images: 243S01, which confirmed Face 2, showing it indeed had a nose, and 541A14 showing the top Face 1 but at a lighting condition that made Face 2 disappear, demonstrating that it had lower relief. However, after careful study of 86A10, and the other two images, plus many lower resolution images, I concluded that the two faces were also artificial, like the one in Cydonia, though Face 2 was more two dimensional.



Utopia Faces 1& 2 in Viking frame 541A14 , note Face 2 is not recognizable, being apparently of low relief

Utopia Face 2 in Viking frame 243S01, showing apparent face brow and nose

The Soviet Union responded to our presentation at the Case for Mars II conference with an article in their English language propaganda magazine ***Soviet Life,*** modeled after our own **Life** magazine.[2] There, strategically placed between articles on the eminent Russian Scientist Yakov Zeldovich, whom I knew was held in awe by nuclear weapons scientists at Livermore, and an article about Nuclear Power, was an article about a Russian Researcher Valdimir Avinsky, who had researched Cydonia. The Russian

article was straightforward and cited Avinsky as saying it was sign of a dead civilization. This article meant that the message of the IMIT Mars investigation had crossed between the worlds of the West and Soviet sphere. We had succeeded. But I now had to deal with the aftermath of that success.

In the final weeks I had at Sandia, I gave a talk on the results of the IMIT investigation, and I included the Utopia Faces. This was received by my colleagues with delighted astonishment. They liked it and joked that an enormous body must lay buried underneath the face at Cydonia. They were a good bunch, and none of them suspected I was leaving. I called Carl Sagan's office to ask about references for his previous searches for civilizations on Mars; to my surprise I was then talking to him on the phone. We had a pleasant chat, but he chided me and the IMIT group for "causing trouble" on Mars when they were trying to get a new probe sent there. I said we were only doing what he had done, looking for signs of civilization. He gave me the references and I thanked him.

True to my word, I formally resigned from Sandia in November, partly regarding the whole thing as a massive fiasco on my part. It was the first big failure in my life, I felt at the time. Now I look on it as an unfortunate learning experience, common to first job holders just out of school. I also believe that my investigation of Cydonia played a big role in my being pressured to leave. It had hit a nerve somewhere, and from that somewhere, additional pressure was brought to get rid of me. However, I had much to be proud of at Sandia. I had arrived knowing little about electron-beam hose theory and in three years I had mastered it, publishing not only the article with Ed Lee, but a theoretical study on "self hose."[3] Between those two works, it appeared the basic problem of hose instabilities in high current electron beams propagating through the atmosphere could be solved. I also authored many other reports and memoranda on ion-beams and ion-beam fusion also. These are the things that last, long after petty squabbles and their effects are forgotten.

I carefully cleaned out my office at night, wore a suit the next morning, said goodbye. My colleagues, suddenly aware I was leaving, asked me where I was going. My three month job search had been unsuccessful up to that point. I had wasted a precious 2 months trying to go back into magnetic

fusion, but it had suffered terrible budget cutbacks. Therefore, I replied to them that I didn't know where I was going. This caused my colleagues, who had seen the triumph of my electron beam hose theory, to regard my departure with terrified astonishment. I felt especially bad for my friend Tom, who had stuck up for me, and whose good advice I had not followed. I had informed him weeks beforehand, so he could be forewarned, and he was not shocked like the others. I was to find out later that several of my colleagues decided to leave Sandia Labs after this. However, my office was left spotless; the 480 Volt socket was now ready for yet another 120 Volt bulb to be screwed into it.

I got a nice letter from Carl Sagan a few weeks later, apologizing for his criticisms of our IMIT effort. He offered to review any article we wanted to write. Puzzled by this sudden friendliness, I called his office the next day to thank him and explained to his secretary that I had left Sandia and was going someplace else. To my surprise I again found myself speaking to him on the phone. My wife stood by transfixed, listening to us speak. Then he revealed the real source of his friendliness.

"I heard you have found some new objects on Mars" he said. The Mars community is a small planet.

"Yes, they are quite interesting, I can send you some copies of the images if you like, "

"Yes, I would like that, "he said. I copied down his office address at Cornell University, I grabbed some copies of the Utopia images I had, with comparisons to the face in Cydonia, stuffed them in a stamped envelope and put them in the mailbox just in time for the Post office truck to come by and pick them up. I had put the name Carl Sagan and Cornell University in large letters on the envelope. I think I decided to quit thinking about Mars after that and concentrated on finding a new job.

"It looks like you were right about Mars," said my wife in wonder, after I came back in the house.

"Yeah, it looks that way," I said.

Sadly, I learned later that my boss, with the poker face, was diagnosed with Huntington's Chorea, a fatal degenerative brain disease, after I left. A

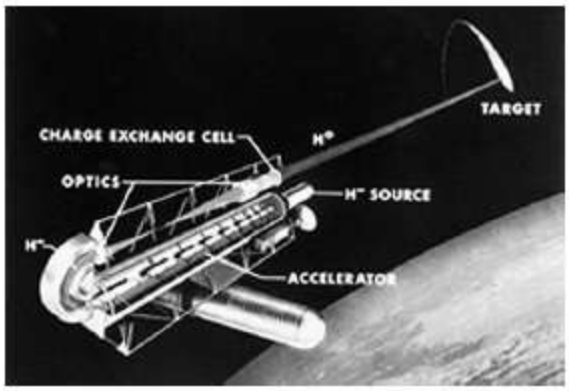
‘poker face’ can be an early symptom of this disease. He committed suicide roughly a year later. It is entirely possible he simply did not remember OK-ing Ed Lee’s changes to the fire-hose theory manuscript.

A month later, it was 4 AM, many hours before dawn, and I was on the beach in Maui staring at the Southern Cross and the beautiful golden light of Alpha Centauri, the 3 star system that holds the closest stars to the Sun. I was intoxicated by its beauty. I had just finished reading the excellent science fiction novel ***Star Tide Rising*** by David Brin about a tropical isle on a faraway planet. On this planet a group of daring Earth intelligences, only some of which were human, sought refuge. They hid from the battling fleets of the major galactic powers prowling space around them, now engulfed in war, a war triggered by the transmission of an image of an ancient galactic relic carried by the Earth ship. This relic was a carved humanoid face.

We hung out on Maui for two weeks, came back, sold our house for a good profit, and we moved to Washington D.C. where I had gotten a new job as a physicist. I was now working on “Star Wars” defense. I had, by the grace of God, averted complete professional and financial disaster in Albuquerque. I had helped, if only in a small way, the human race avoid nuclear annihilation and helped discover a dead civilization on Mars. Now I was determined to show that I could master the “business of physics” not just its highest aspirations. I had ignored my friend Tom’s good advice at Sandia. Now I followed it to the letter.

I had arrived in Washington DC at the beginnings of the Reagan Arms Buildup, a time of unparalleled excitement in the defense-science community. The Cold War had experienced a “Sea Change,” completely transforming itself from being about mutual mass death on Earth to massive defense in space. My good new boss, Bruce, whom I really liked and respected, was frantic for our company office of Mission Research Corporation, to grow in the new environment of Space Defense. He had hired me because of my electron beam theory success and my interest in space. However, my wife did not like Washington DC, did not like my work on Star wars, and wanted to move back to Albuquerque. She is part Native American, and felt closer to her people in Albuquerque. I realized my marriage was part of the losses I have suffered because of Mars, but I still felt that it had been

worth it.



A particle beam weapon concept for space defense (courtesy DoD)

I am convinced our daughter Elizabeth grew up in a better world because of my involvement in the IMIT Cydonia investigation. It had confronted both superpowers with the most terrifying sight imaginable, a blasted, devastated world devoid of life, with an atmosphere full of nuclear explosion isotopes, from whose surface stared a mute, carved humanoid face. It was like the sight of the half-buried Statue of Liberty at the end of the ***Planet of Apes.*** In the face of this, MADness had ceased to make sense. But the fact that my marriage was ended, and my wife and daughter would move back to Albuquerque, was a terrible loss to me, almost more than I could bear for a time. I responded by throwing myself into my work.

Sad end-scene of the Planet of the Apes, 1968

One always wonders about one's choices, and what part of one's life one endangers in order to try to make another part safer. I had tried to help change the conversation on Earth, to make it focused on the stars rather than the W. German frontier, and it had been too heavy a task for my job and marriage to bear. It would be simple enough to say I sacrificed those good things for a greater good, but I distrust simplicity in such complex matters. I had made a choice, I had considered the dangers, and I bore the painful consequences.

Physics was my solace then. I began work in-earnest on unifying gravity and electromagnetism then, the GEM theory. As one result, I was able to derive and publish an astonishingly accurate formula for "G", the gravitation constant. [2] Also my work on Star Wars defense cheered me. The Cold War raged on, but now the Cold War was about space. That much had changed.

Whereas the MAD phase of the Cold War I had experienced in Albuquerque filled me with ambivalence, the SDI (Strategic Defense Initiative) phase that President Ronald Reagan had initiated, filled me with enthusiasm and inspiration. Despite my initial skepticism I had embraced Strategic Defense as the only alternative to MAD. That pundits in academia decried SDI now made little difference to me. They had always been concerned with calculations of probabilities in warm offices, but to us in defense it was calculations of risk in the front trenches that were important. Their strength was their detachment, our strength was our motivation. The risks of the Cold War, as it had been played, were no longer acceptable. SDI, literally a "Star Wars" defense, played to the vast American advantages over the Soviet Union in space technology, computers, and sensors. Reagan had utterly changed the rules of the game, and patriotic scientists like me responded with vigor.

I had learned that science was a business in Albuquerque, a harsh business at that. But now arrived in DC, I was determined to succeed at Mission Research Corporation, a respected defense contractor, and erase the stain of my fiasco at Sandia. I was much more focused on work now. However, I was curious about what Carl Sagan thought about the new faces in Utopia, and as soon I was settled in my new job, I placed a call to his office. It was a frantic time, my boss and I were rushing around the Washington Beltway to NRL:

the Naval Research Lab, across the Potomac, we would go, to DNA: the Defense Nuclear Agency and The Army Research Lab. We were selling defense related science projects, ideas and skills were our wares. I had gone from being a scholar and gentleman to being an entrepreneur, and I was good at it. There was much money to be made in the Reagan Defense buildup, a million new problems to be solved and many offices to visit. However, a strange thing happened in the middle of these many sales visits. Carl Sagan kept calling our office, asking to speak with me. Our lovely office manager Darlene was amused when she reported this to me, and my new boss was amazed. In those days before cell phones, Carl Sagan and I played "telephone tag", with me dutifully calling back his office to find him absent. This went on for nearly a week. Finally, my boss and I were planning a new sales pitch to NRL and our office manager came into the office.

"John has a call," she announces with a smile. My boss frowns in response. "It's Carl Sagan" she adds. My boss looks at me with amazement. "And he is kind of snippy," she adds further with a laugh.

"Well, I suppose John should talk to him then, "says my boss, with a chuckle. I go to my office and the call is transferred.

"So Carl, what did you think of the pictures of the new faces?" I ask.

"I never got them!" Carl said flatly.

He and I are silent for a long minute.

I know that this meant the government was now heavily involved, and the government wanted us to know it. My phone calls to DiPietro are now sounding funny, and Vince knows also what this means.

"OK," I say to Sagan, "they are on Viking frame 86A10, and I will send you a fax with the objects circled." I pull out a notebook with Viking frame 86A10 and make a copy and circle the objects and hand it to a secretary to fax to Sagan's office. Then, very much trying to stay focused on my new job, I walk back into the meeting with my boss.

"What was that about? That Mars stuff?" he asked. I had mentioned it to him, but it was not exactly posted on my resume'.

"Yeah, some people have gotten interested in it, apparently."

In a few weeks, Carl then published a Sunday newspaper piece comparing the face in Cydonia to the tortilla with the face of Jesus on it. I was furious.

“This Sagan is a real comedian!” I told Vince. But Sagan included the new image of the face from 70A13 in the article, and this made us wonder if he was playing a deeper game. Sagan and I have other reasons to not get along; he hates SDI as much as I love it.

Sometime during this period, the Utopia site, with the two faces, is officially christened : “Galaxias Chaos” by planetary scientists. The Latin name means “milky broken ground” but I know what it also means. It means somebody’s Galaxy has been thrown into chaos.

Two men, Dr. Brian O Leary, a former astronaut and planetary scientist, and Dr. Mark Carlotto, a brilliant image processing scientist had joined the expanding Cydonia investigation following the completion of the IMIT effort. Cydonia had become a guerilla science movement. Vince DiPietro and I were now working together, since I was now located near Goddard Space Flight Center. With my wife and child having moved back to Albuquerque, I had plenty of time on my hands to do Mars science. Vince and I flew up to Boston to meet with Carlotto and O’Leary and someone else who wanted to spend money on more Mars research. It is Whitley Strieber, the science fiction author. At our meeting, Strieber told us of his UFO abduction experience. Vince and I were not sure what to think, but he was offering us money to do more research, and we certainly were pleased to meet him over this matter. However, he wanted a large proposal written, and I told Vince that writing proposals was now my main occupation and that I only did that if I could draw salary from the research effort at Mission Research. No such result was suggested by Strieber. He simply wanted us to spend money on data and image processing. Vince and I both had perfectly good jobs already, so we respectfully declined. Brian and Mark, however, wrote a large proposal, which was ultimately turned down. However, the meeting did serve the useful purpose of getting us all acquainted and sharing data.

Brian is a trained planetary scientist, and while he never made it into space, he was considered, officially, an astronaut, having completed all training. He also does a great John F. Kennedy impersonation. However, he was also the first of many highly trained scientists who has been impressed enough by the

IMIT investigation to consider that Cydonia represents a dead civilization and that Mars' past may have been more Earthlike. Within the IMIT two schools of thought had emerged, those who thought the face might represent a prior colonization and even terraforming of Mars in the past, led by Hoagland, and those, like myself, who felt Mars had been Earthlike and become the home of an indigenous humanoid species, until some catastrophe had changed it into the Mars we knew at present. Both schools of thought had their merits, and though I favored the indigenous concept, with its Earthlike Mars, that was only because I felt it was the simpler of the two hypotheses, and thus easier to test.

Brian and I spoke several times after that. He worked for SAIC, another firm like Mission Research Corporation. However, whereas I was enthralled by the idea of space based SDI (strategic defense initiative) and the many fascinating physics problems it entailed, he was increasingly depressed by the "weaponization of space" that SDI entailed. I tried to persuade him to stay in the game, that this was space research, but he resigned from SAIC and went his own way.

Mark Carlotto was working for the Pentagon on enhancing space satellite imagery and looked on SDI as just another way to make a living doing space research.

Vince and I were going to a lot of Mars Conferences in Washington D. C. We figured the more we knew, and the more people we met, the more Mars research would be advanced. I had become well versed on the major issues in Mars Science quite apart from Cydonia, and I enjoyed talking with Mars people from NASA and the DC space community. Vince and I were both convinced that if Mars became the focus of the planetary science program again, like before Viking, then Cydonia research would get more data. As it was, only one more probe was planned for Mars, the Mars Observer, and it was not even supposed to have a camera. Imaging data, as it turns out, hogs telemetry channels, and so many other sensors can be flown on a mission if a camera is dispensed with. We both held a somewhat naïve belief that Mars science would simply be persuaded to consider Cydonia as an aspect of Mars science. We wanted more images of the face, so we became quiet lobbyists at champagne receptions for a camera to be included on the Mars Observer.

Vince was a great guy to work with, and we both had similar ‘working class’ backgrounds. I was a guest at his house several times for dinner, meeting his lovely wife Grace and his daughter Andrea, who was born only two days before my daughter Elizabeth. Seeing Andrea reminded me of Elizabeth growing up safe and well taken care of in Albuquerque and made me feel it had all been worth it. Vince was also very practical. I had been the son of a Medical Doctor, but never felt like one, growing up in a working class neighborhood of Medford Oregon, a rugged logging town in Southern Oregon. He had grown up in an Italian neighborhood in Baltimore Maryland. Being newly single, Vince also introduced me to a string of attractive women who worked with him at NASA Goddard. So it was a good collaborative relationship.

However, we both knew we were under government surveillance. I would call him from Northern Virginia where I lived to Maryland, near Baltimore, a long distance call. The phone line would begin sounding funny, usually right after we mentioned the word Mars. When the phone line would pop and crackle after the word Mars, we would both respond by mixing our discussions of what to do next on Mars with patriotic speeches concerning how we wanted an American manned Mars mission because we couldn’t allow the Russians to get to Mars first. We based his conviction on the grounds that Cydonia, even though it looked primitive, might have advanced technology buried in its ruins. We must have made that patriotic speech a thousand times between us, probably driving the intelligence people listening to us to tears from boredom. However, we also meant every word of it. To add to the absurdity, calls to Vince no longer appeared on my long distance phone bill.

“Vince, we have our very own long distance phone company!” I laugh over a beer, and showing him the mysterious bills, where none of my calls to his house appeared any longer.

One of our friends, who would accompany us on our trips to the Washington DC Mars conferences with their sparkling champagne receptions, was Larry. Larry was a PhD astronomy professor at a local community college in Maryland. He was very knowledgeable about Mars and we gladly shared everything we were finding, including the Utopia faces. But

Washington DC is actually a “small town” in our circles.

At the conference to celebrate the tenth anniversary of the Apollo Salyut linkup in 1975, I had arrived not knowing exactly which building it was in near the US Capitol, and asked a stocky fellow in a green suit standing on the street corner for directions.

“Is this the US Academy of Sciences Building?” I asked him. He looked startled, as if I had disturbed him day dreaming, and he blurted out “Yes,” before walking away. I was puzzled by this behavior but grateful; later inside the building at the conference, when he mounted the stage with three US astronauts, I would discover that I had asked a Russian Cosmonaut, Valery Kubasov, from the Apollo Salyut mission, for directions in downtown Washington DC.

Later at the conference, all three of us were standing there together in the hall, Larry, Vince and me, when an Air Force Colonel approached us, greeted Vince cordially, then turned to Larry and said.

“Hi there Larry. How are things at the DIA?” the DIA is the Defense Intelligence Agency, the “Pentagon’s CIA.” Vince looked at me in alarm, but I simply grinned and motioned for him not to get excited. Larry, obviously a real professional, didn’t even bat an eyelash.

“They’re just fine, Colonel. Thanks for asking,” says Larry cheerfully. Larry kind of wanders off after that at the conference, and we did not see him much for several years. Vince was stunned, but after Larry left, I assured Vince.

“Well Vince, we thought this stuff on Mars was important. Now apparently, a lot of other people agree with us!”

Sagan was there at the conference, urging a joint US/Soviet Mission to Mars to help end the Cold War. [5] It was now apparent that more than just the Cold War had suffered a sea change in the previous year. Somehow, Sagan, either because of the terrifying intensity of the Cold War, or his exposure to Cydonia data, or some combination of the two, was now advocating a joint American-Russian human mission to Mars. This was a big reversal for him; he had previously urged only robotic missions, but now he seemed to realize that history was about human beings.

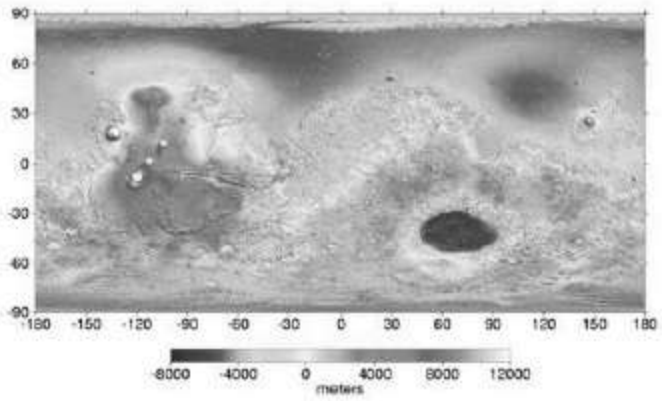
We met briefly in the hall at the Apollo Soyuz conference and I was able to introduce Vince DiPietro to Carl Sagan, before Carl had to leave. It is progress, though I am still annoyed at Sagan for the “Jesus- tortilla article” and I regarded him warily. But Carl had erased any talk at my work that I was a “Mars nut,” so I was grateful to him.

Later in 1986, after reading about Mars science voraciously, I decide to move on the Mars ocean hypothesis and put in an abstract. There was to be a conference on Mars called MECA (Mars, Evolution of its Climate and Atmosphere). The paper, entitled “The Paleo-Ocean of Mars,” was presented in the late afternoon as the last paper. [6] I was nervous; this was the first time I had made a formal spoken presentation to a Mars conference. But I was well-prepared, and working as a defense contractor, my viewgraphs were crisp and produced by a word processing program, whereas many of the other papers had handwritten viewgraphs, some nearly illegible. As I sat waiting for my time slot, I overheard a man and woman talk, the woman wanted to leave, but the man said, ‘no, I want to hear the reaction to the Mars ocean paper’, and I was suddenly encouraged, and my usual confidence returned. I knew I could change history, then and there. The paper ahead of mine was by a guy named Parker from JPL, and he was shaking like a leaf when he delivered his paper on “long-lived seas and lakes on Mars.” He muttered his last words, reciting the title of the talk basically, barely audible. Mars-science was obviously a kingdom of fear for those who dwelt in it. But I was a brash invader.

I then assumed the podium and proceeded to present an entire ocean, filling the northern plains. My hypothesis was based on geomorphology, estimates of Mars past water and the oceanic clays found by both Viking landers that landed on the former sea bed. I put up a map showing the entire northern plains of Mars filled with an ocean. The audience reacted very favorably and asked many questions. I was urged to write a journal article and wished to. However, an avalanche of work at Mission Research overwhelmed me and I had to be content with the published abstract. My boss wanted proposals, not articles. Despite this, the concept of a Paleo-Ocean was planted deeply on Mars. As I wrote in my book: **Life and Death on Mars:**[7]

“The Lunar Mars model was losing ground to a more Terrestrial Mars model. While everyone had been watching the Mars meteorite show, the concept of Mars had undergone a ‘Sea Change’. Mars had acquired a paleo-ocean on its northern plains.

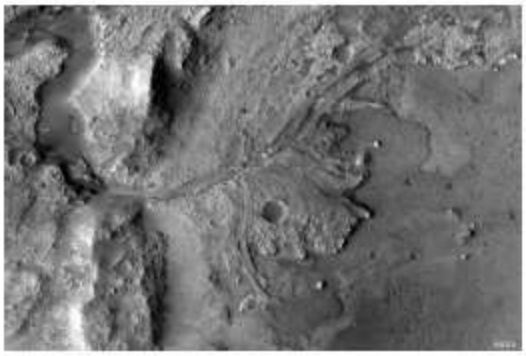
The paleo-ocean filling the northern plains was proposed by the author in 1986 at the Washington, DC MECA meeting. This hypothesis was based on widely recognized features of Mars data. It had been proposed earlier by David Chandler in his book, ***Life on Mars*** (1980). The Mars community, however, has insisted on giving credit to Timothy Parker, despite the fact that he proposed only small seas. After all, he was member of the tribe, and I was not. However, as its original proposer I have named it the Mallacandian Ocean, after the name of Mars in C.S. Lewis’s Perelandra Trilogy. My involvement in the Cydonia debate had forever marked me on Mars as a dangerous person. Parker does deserve credit for bravery, for at the time, any such proposal was considered radical, and it must be known that science punishes radical views and those who proclaim them. They are denied tenure, and even funding in some cases. However, happily in this case, Parker survived and much good work by Parker and Head has buttressed the evidence for the northern paleo-ocean. The paleo-ocean appears to have had several sizes during Mars history, and appears to have shrunk in time.



Mars’s northern plains form an ocean basin (JPL/NASA)

The hypothesis that Mars had a paleo-ocean of large extent in area and duration has been motivated by observations of geomorphology-the study of landforms, more than anything else. The northern plains region appears to be an old ocean basin, and the numerous water channels appear to have emptied into it. On a smaller scale, several craters in the southern highlands appear to have held lakes. The northern paleo-ocean was the destination for countless Martian rivers that carved channels or vast areas of the Martian north.

The second strong reason for an ocean filling the Martian plains was estimates of how much water had flowed into all the river channels of Mars. The old river beds of Mars are large, and stretch for hundreds of kilometers. In some places it is apparent that catastrophic floods have been unleashed, sweeping all before them to the ocean shoreline. The flood waters appeared to have flowed for months, based on the eroded islands they left. When the amount of water flowing in these channels was estimated, it yielded the equivalent of a 400 meter deep layer covering the entire planet. The ocean basin in the north covered approximately one-fourth of the planet's surface and had an average depth below "Martian sea level" of 1.5 kilometers. Thus the 400 meter deep layer was a good match.



Delta formed by long flowing water on Mars
(JPL/NASA)

The fact that the edge of the basin all around its circumference, a radical change in landform from rugged and crater-pocked to smooth and much less cratered at a common elevation, presciently termed "Martian sea level." This term had been coined earlier by Mars cartographers and was based on the fact that barometric pressure, 6 millibars at that elevation and below it, allowed

liquid water to exist. This coincidence with a change in landform solidified the interpretation that it represented the edge of an ocean basin. Thus even on modern Mars, enough atmosphere existed to keep water liquid in the ocean basin at temperatures just above freezing. However, there was other evidence for existence of the ocean.

The Viking landers had both landed on the smooth plains of the old ocean basin, and the soil they analyzed at each site was remarkably similar, and equally salty. This showed that some force had been at work to ensure remarkable chemical equilibrium, despite the fact that the Viking landing sites were separated by thousands of kilometers. This was particularly true of water soluble salts of chlorine and bromine, as are found in terrestrial sea salt. Added to this, the soil composition resembled oceanic clays on Earth.

The Vikings and Pathfinder landed on the Paleo-Ocean bottom (JPL/NASA)(see color plates)

The isotopes of Mars hydrogen suggested that much water had been lost over Mars' history. Mars has no oxygen or ozone layer to protect the surface from ultraviolet light. The ultraviolet light on Mars is so harsh it gives even water "molecules" a sunburn," breaking them down into hydrogen and oxygen. The oxygen and hydrogen, both being lighter than the carbon dioxide atmosphere, rise, and in the case of hydrogen, are lost to space. However, the hydrogen is not all the same and so heavier hydrogen isotopes escape more slowly than ordinary hydrogen. Hydrogen in nature comes in two varieties: ordinary hydrogen with a simple nucleus of one proton, and at approximately 1 percent, a heavy hydrogen isotope with a nucleus of one proton and one neutron. It is this form of hydrogen, purified and concentrated and combined chemically with oxygen, which was the infamous heavy water used in the

Nazi atomic bomb effort in World War II. The heavy hydrogen is twice the weight of ordinary hydrogen and thus does not float as high statistically in the atmosphere when it rises. The lighter hydrogen floats higher on average and escapes to space via a number of processes, such as a sandblasting effect of the impact of solar wind particles on the top of Mars's atmosphere. Therefore, the hydrogen in the Mars atmosphere becomes heavier in average isotopic weight over the eons as the process continues. This means the degree of fractionation of isotopes, the sorting of the isotopes by weight, increases with geologic time. Earth, with its ozone layer and heavier gravity, and magnetic field that prevents the solar wind from affecting the top of the atmosphere, prevents fractionation to the degree that would occur on Mars. Therefore, adopting the Earth ratio of hydrogen isotopic abundance as a yardstick, we can measure the different ratio of abundance of isotopes on Mars and use this as an indicator of the history of Mars.

Based on Earth and Solar hydrogen standards, the isotopes of hydrogen and other light elements are highly fractionated on Mars. This indicates that Mars has suffered much atmospheric loss by processes in the upper atmosphere. Hydrogen fractionates easily, so its large fractionation was not a surprise. However, by comparing the amount of fractionation of nitrogen, oxygen, and hydrogen on Mars a marvelous thing was discovered. It was found that the oxygen was hardly fractioned at all relative to hydrogen and nitrogen. When the models were run, this relative fractionation indicated that a vast reservoir of water had existed and had replenished the oxygen in the atmosphere even as water molecules were broken up and the hydrogen and oxygen were lost to space. The amount of water was estimated to be approximately enough to cover Mars's surface to the depth of 300 meters, almost the same amount estimated by the geologists looking at the flood plains. So by two widely different methods approximately enough water to cover Mars to the depth of ½ kilometer over its entire surface was found to have existed on Mars in the past. That was enough water to fill an ocean covering the northern plains of Mars.

Despite the geologic and nuclear isotope experts' opinions, the Mars climatic and atmospheric people have been hostile to the idea of a Mars ocean. The northern paleo-ocean of Mars, simply by its existence, has profound implications for Mars's geochemical history. If it had existed, it

would have had an enormous effect on climate.

The fact that an ocean sat in the north of Mars means that the conditions on Mars had to have been Earth-like. The liquid state of water is one of the most demanding in terms of conditions of pressure and temperature. The presence of liquid oceans on Earth, defines terrestrial conditions of temperature and atmospheric pressure. Moreover, the presence of an ocean does not just define atmospheric conditions of pressure and temperature, it also stabilizes them.

The oceans of Earth act as an enormous “flywheel” on the atmosphere and climate of Earth. By flywheel we refer to the idea of mass in an engine that keeps it spinning at a nearly constant rate despite fluctuations in power and workload. Water has one of the largest heat capacities of any common substance. This means that when a quantity in a system is at a certain temperature, it will tend to maintain that temperature despite heat entering or leaving the system. If one adds energy, as when the Sun rises at dawn, the water literally soaks it up and stays at nearly the same temperature. When the Sun sets, the water stays warm. This effect accounts for why regions of land near the ocean have milder climates than do regions inland, provided the prevailing winds are from the sea. Water also evaporates and condenses, and dissolves gases, thus stabilizing the atmosphere.

An ocean stabilizes atmospheric pressure because it can change from liquid to gas, but also because it can carry gas in solution. If the pressure of the atmosphere drops suddenly over an ocean, the water evaporates more rapidly and restores the gas pressure to a degree, if the pressure increases, whch causes condensation to occur, lowering the pressure. The ocean water also carries dissolved gases. On Mars the dominant gas in solution would have been carbon dioxide.

Carbon dioxide is very soluble in water, with approximately each volume of water holding an equal volume of gas at STP: Standard Pressure and Temperature, or 1 atmosphere at 0 degrees Celsius. Anyone who has shaken a bottle of soda pop and then popped the lid has experienced this. On the surface of an ocean several kilometers deep with an Earth atmosphere of carbon dioxide above it, approximately an entire atmosphere could be held in solution, with much of it at lower depths where higher pressures allow more

gas to be in solution. On Mars the ocean would be highly charged with carbon dioxide, and if a sudden fluctuation in atmospheric pressure occurred, due perhaps to an asteroid impact, then the ocean would have frothed like a bottle of soda pop and the gas released would have made up for any pressure drop.

Thus, a Mars with a paleo-ocean would not only have had a climate like Earth, but the climate would have been stable. However, a specter haunts all studies of Mars, and that is the specter of Wells. This specter means that any new interpretation of Mars history that makes it more Earthlike is resisted mightily. This is because a paleo-ocean on Mars means the red planet held life, and a paleo-ocean on the northern plains means it held life for a long time.

Mars with the Malacandrian Ocean (JPL/NASA)

The ocean was believed to have been the original incubator of life on Earth, so the presence of an ocean on Mars is a powerful argument that life had begun on Mars. The watery environment supports and protects life from ultraviolet light and provides a bath of minerals for growth. If Mars had an ocean, then living things probably lived in it. The question would be not whether life had begun on Mars, but how long the ocean, and the life in it, had endured. With the discovery of the paleo-ocean, the answer, in the context of previous theories about Mars climate history, was shocking.

The Mars paleo-ocean was on the wrong side of the Martian dichotomy to be accepted. The ocean was on the youngest terrain of Mars, not the ancient

part. It sat on the portions with few craters. Few would argue that an ocean could have temporarily existed in the early parts of Mars history, when many water channels were being formed in the southern highlands. However, the ocean did not sit in the middle of the ancient southern highlands; it sat in the north, on the low smooth plains surrounding the water ice cap. This seemed unacceptable. This would mean that the ocean would have existed on Mars, not for a brief period in the beginning, but for most of Mars's planetary history. Given the vagaries of Martian terrain dating schemes, the ocean may have lasted 4.0 billion years. The openly articulated reasons for why this seemed unacceptable had to do with the understanding of the planetary greenhouse.

> Mars is too far from the Sun to allow Earthlike temperatures; it requires a boost to trap the heat of the sunlight. This effect occurs on both Earth and Venus because of a carbon dioxide greenhouse effect. This greenhouse effect of carbon dioxide is so strong that the surface temperature on Venus is higher than that on Mercury, even though Mercury is twice as close to the Sun. But on a planet like Mars, it was believed no greenhouse could have lasted for more than a few million years, certainly not 4 billion."

The Russian Mars probe Phobos arrived at Mars in 1988 and then failed mysteriously. Vince DiPietro called up the Russian embassy to enquire about its status, but was assured by somebody named Boris that the probe was functioning perfectly. He hung up the phone in frustration, only to have it begin ringing again instantly. It was our old friend Larry from the DIA.

"Vince! Don't call the Russian embassy again! We monitor all those lines!" scolded Larry over the phone. Larry then hung up.

Later, we were at yet another Mars meeting downtown in DC. We were working the crowd and I ran into Admiral Truly, former Shuttle astronaut and now ex-head of NASA. He and I had met during my participation in the NASA Synthesis group. He said, 'Well I did the best I could,' in regards to this struggle to move Human space flight out of low Earth orbit. I congratulated him, as a fellow veteran of seemingly hopeless scientific battles, "Sometimes impregnable fortress's need to be stormed anyway," I

said to him.

Because of my work on SDI, I was now a full-fledged space scientist. I was doing orbit and rocket burn calculations constantly to support my SDI work. I was looking at space sensor systems and environments, especially space environments created by nuclear explosions in space. We were playing space war games, Red Team versus Blue Team. I was part of the Red Team, using Russian space technology to test SDI defense satellite constellations. The Blue team would field their satellite constellations; we would use our own satellites to counter them.

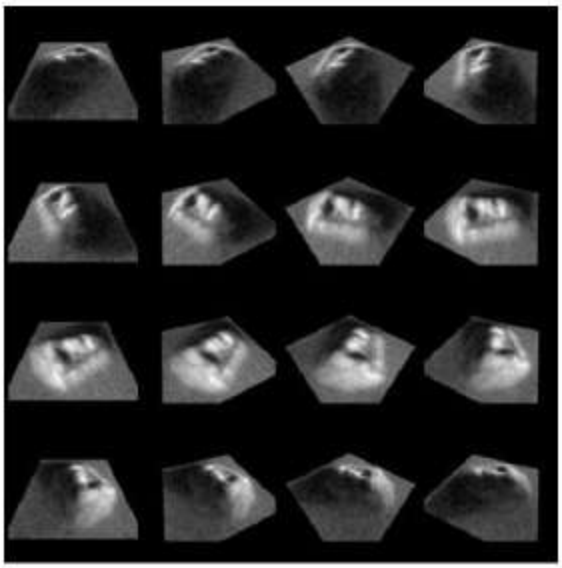
Thomas Rautenberg and David Webb, both members of the IMIT group, set up a meeting about Cydonia with members of the Planetary Society. Sagan is there with another member of the Planetary Society, physicist Louis Freidman. As related in the book ***The Martian Enigma's*** by Mark Carlotto, Freidman not only refuses to look at the images of the Face on Mars but hides his eyes from them.[8]

I considered this reported behavior to be ludicrous for a scientist, but I was also aware that science was a business and finding a dead civilization on Mars was obviously not part of the Planetary Society's /JPL's "business plan for Mars." Science is a business and the Planetary Society exists to promote JPL, who had said the "face of Mars "was just a trick of "light and shadow" and so that's where things stood, period. They even went so far as to claim that the second image of the face on Mars "did not exist," though it was right there in the NASA files.

However, while Vince and I were working the crowd at yet another space champagne reception in Washington D.C. I introduced Sagan to Vince DiPietro again. Sagan and Vince sat in the corner and had a long amiable chat. I left them alone to talk. Sensing a possible breakthrough, I approached Louis Freidman and waited to introduce myself as he talked to some other people. To my amazement he snarled some obscenity at me and shoved me backwards and stalked away. Fortunately Vince was by that time standing near me and kept me from falling. Astonished, I regained my balance and said to Vince, "I guess they don't want to be friends after all!" Sagan had shown himself to be quite friendly, but obviously the rest of the Planetary Society remained quite hostile. Curiously however, the planned 1991 Mars

Observer mission, touted to be the “last mission to Mars” because Mars was now an ‘uninteresting planet’, suddenly acquired Mike Malin’s new Mars Camera. This apparently was done over furious opposition, to the extent that one NASA official tells me at a champagne function, “the Mars Observer camera is attached to the spacecraft with explosive bolts, so it can be jettisoned at any time.” But Vince and I and the rest of the Cydonia investigation regard this as a great victory.

Dr. Mark Carlotto, a genius at digital image processing, now stepped forward with beautifully enhanced images of the Face and everything else in Cydonia. He also developed a “shape from shading” algorithm that enabled us to study the Face as a three dimensional object, and predict how it would look under different illumination conditions.[9] He also found evidence of ornamentation on the helmet.[10]



A three dimensional model of the Face at Cydonia constructed from the Carlotto ‘shape from shading model (courtesy Carlotto)

Several years after I left Sandia I encountered Bruce, one of the electron-beam project managers. We had dinner together, and took the opportunity to apologize, for as I put it, “screwing up” at Sandia, his reaction was polite, and he accepted my apology cordially, however, he seemed like he was bursting to say something to me. Later I would find out that my theory of beam

stabilization by “rifling” had been verified over long distances. Unfortunately, the failure of the main program at Livermore doomed the electron beam weapon project and the Sandia program was also ended.

The Cold war ended shortly after that. It ended with astonishing and mysterious suddenness. As one of my colleagues commented: “If you had written this scenario into a book, no one would believe it.” The Cold War, in its battles in Korea, Vietnam and a dozen nameless skirmishes, had lasted 42 years and caused more US combat deaths than World I. It had brought the world to near destruction several times. With the end of the Cold War also came the end the Reagan Arms Buildup, but fortunately, because of Mars, I had become a space cadet.

Space-Defense spending declined far less that other areas of defense spending after the end of the Cold war, because so many of the security arrangements in the post-war period depended on Space surveillance for verification. The end of the Cold War finds me working for a space contractor.

In retrospect, my involvement in Mars did not hurt my career, as I feared it would. In fact, because of contacts I gained in the Space Defense realm, it actually helped it. It also led me to change my career direction into space. I had been trained to be a plasma physicist, but because of Cydonia and the Reagan Star Wars space defense effort, I had now become a “rocket scientist.”

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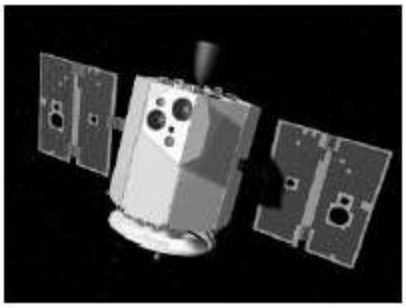
Chapter 4 A Rocket Scientist in the Martian Wars

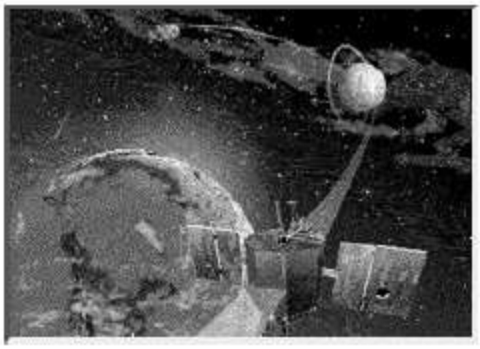
"In space, no one can hear you scheme"

John Brandenburg during the Clementine Missions

In the 1991-1992 timeframe two ferocious conflicts were fought over Mars in the scientific community. These wars were triggered by the twin events of the overwhelming success of the Clementine Mission to the Moon by NRL and the astonishing failure of the Mars Observer by JPL. NRL and JPL would duel over Mars.



The Clementine Spacecraft



The Planned Clementine Mission: first to orbit the Moon then fly past an asteroid

I was working as a deputy to the Mission manager Trevor Sorensen on the Clementine Mission.[1] The Clementine mission was the brain-child of the

brilliant and tragic Stewart Nozette, who was its chief scientist. The mission was a few months from launch when the MO (Mars Orbiter) approached Mars, and disappeared. I had been involved with the NRL LACE satellite mission before this, in data analysis. My role on the Clementine mission was to be, as Trevor put it so graciously, as his “Tiger Team” or ‘trouble shooter.’ Trevor’s dedication to the success of the mission was all consuming. After the launch of the Clementine, he lived in his office at the Clementine mission control, which had a small bathroom and shower attached. He would only leave the building to join his family for breakfast and receive from them a change of clothes for the duration of our mission at the Moon. But even as we prepared feverishly for the launch of Clementine to the Moon, the MO approached Mars and prepared to assume orbit around the Red Planet. Excitement over the MO was felt even by the Clementine team as we prepared for our own launch.

The Ill-fated mars Observer Spacecraft

MO had carried a camera apparently because of the face in Cydonia, but was operated by Mike Malin, the “prickly SOB” of the Case for Mars II meeting many years before. We of the Cydonia scientific crew considered the presence of the camera on the MO to be a triumph since the face in Cydonia was the only thing on Mars worth imaging at this point.

Despite this camera’s presence on the MO being due to Cydonia, Malin was a very vocal critic of the Cydonia investigation, and he declared the face in Cydonia ‘just a funny looking hill.’ Hoagland and Malin had exchanged verbal broadsides in the months after the MO’s being sent to Mars.

Vince, Gregg Molenaar and I had been presenting papers at conferences and finally had written the Cydonian Hypothesis, predicting that new images of the face of Cydonia and other objects would, despite erosion, show new anatomical and structural details, because they were artifacts built by an indigenous race of Martians, and, therefore, needed to be observed at close range.[2] I was excited, looking forward to new images. However, Vince seemed depressed, and had been skeptical before the MO reached Mars. I attributed this to his Italian outlook on life: that nothing was as it seemed.

“I don’t think we are going to see any new images of Cydonia from that probe,” Vince said morosely. “I don’t think it will be that simple.” He turned out to be right. The MO disappeared, just as it was supposed to assume orbit around Mars. It was stunning, to me and to everyone else in the science community. No space-probe of the United States had ever disappeared so suddenly and completely.

This disappearance of the MO, however, was the next best thing to new images of the face. It played right into the hands of the Cydonia investigators. The disappearance of the MO, especially since Malin had made such a vocal tantrum about reimaging the face, made Mars the most fascinating planet in the solar system again. Given the degree of government covert interest in the Cydonian investigation, one could speculate that the mission “was taken Black” to give the government a chance to take new images of Cydonia outside of the public view. On the other hand, the NRL investigation into the MO had revealed so many fundamental problems with the spacecraft that an NRL engineer told me, ‘no single cause for the failure could be assigned, since so many possibilities existed.’ It was discovered, for example, that the spacecraft architecture was so flawed that with merely some badly sequenced valve commands, it was possible for the main engines’ oxidizer and fuel tanks to connect directly to each other rather than the rocket engine. Since the propellant and oxidizer, hydrazine and red fuming nitric acid, would explode on contact, a computer glitch could easily result in blowing the whole spacecraft to pieces. In any case, the day of reckoning in Cydonia was postponed.

I was at NRL finishing a report on a previous LACE satellite mission when one of the NRL scientists spotted me sitting in an office.

“Brandenburg, what are you doing here! You have to get over to the Clementine Mission offices!”

“Why?” I said rising from my chair in puzzlement.

“Because you’re the Mars expert and were going to Mars!”

When I reached the Clementine Mission planning offices, now christened because of my Mars papers as a “Mars expert”, things were in a frenzy. We were in the middle of what could be called a “Mars Crisis.” In the rarefied world of space/defense work, the loss of the Mars Observer was being treated like the torpedoing of a US Navy destroyer in the Persian gulf. People were talking as if someone or something was denying the US access to Mars space, and the US space community was determined to regain that access. Several proposals were being floated to launch spacecraft to Mars at the next launch window, roughly a year away, and from the way people were talking, several probes might be launched at once. Access to Mars was now being treated as a vital national interest, and it was going to be asserted aggressively. Long gone were the days when space scientists had said that the Mars Observer was going to be the “last probe to Mars.” Mars was now the most important planet in the solar system besides Earth. I was immediately tasked with putting together a mission profile to explore important science targets on Mars from Mars orbit.

Dan Goldin had apparently called NRL, enraged at JPL’s conduct on the MO mission, and asked NRL to prepare a Mars Clementine for launch at the next launch window to Mars in 1 year. I was by then heavily involved in the planning for such a mission and even helped design cameras to obtain slightly better than Viking resolution over wide areas of Mars. A high resolution camera was planned to obtain ten times better images of selected areas of Mars. I even drew a set of ten science objectives, including the Mars paleo-ocean and reimaging of the face in Cydonia, and this list was circulated and discussed. It seemed like a dream. However, as the weeks went by, the sense of crisis ebbed. What began then can only be called the First Martian War.

For weeks, on Capitol Hill, in the White House, and in NASA headquarters in downtown DC, the Planetary Society and we contractors lobbied furiously

back and forth. Secret meetings occurred at night in deserted parking lots where folders of engineering drawings and plans were exchanged.

However, despite the brave fight, and despite the fury that Dan Goldin directed at JPL, the Southern California Congressional Delegation was too strong and JPL managed to tenaciously maintain control of the Mars program. JPL owned Mars it seemed, and nothing could change this. JPL insisted everything was fine at Mars, and there was no crisis. All that was necessary, they said, was for everyone to calm down and leave them to solve this Mars problem on their own schedule and with their own procedures.

I commented that 'NASA was like a family restaurant, where the dishwasher could break dishes, harass the waitresses, and take too long on smoking breaks, and you could take him out in the alley and beat the crap out of him, but he couldn't be fired, because he was family.'

It seemed, after JPL studied the matter of what to do next at Mars, that the Mars Clementine instruments were 'not adequate "and would even 'set back Mars science!'

Ridiculously, the same JPL panel that said everything was fine at Mars then recommended building an exact duplicate of the MO and sending it to Mars again. This, despite the fact that the MO's loss was still unexplained and its architecture was considered 'problem prone.' Goldin, reportedly, angrily ordered the JPL delegation out of his office after they delivered this recommendation.

The Clementine was launched to the Moon and became a spectacular success. This impressed Congress, which was also angry at JPL over the MO. Congress refused to fund a replacement for the MO. So now nothing was going to go to Mars. But this did not sit well with anyone, so in a few months, the Second Martian War was declared. This time the leverage was the Space Station, NASA's flagship human space flight project.

One consultant on the Clementine mission was a retired scientist from JPL and he told me of the tensions existing within NASA concerning Mars. While he had worked there, one senior JPL manager told him: "We know that if we find anything exciting on Mars, the astronauts will come with their big rockets, and take Mars away from us!" So the basic conflict over the Red

Planet was between Houston and Pasadena. The prize was billions of dollars in programs to explore the most fascinating planet in the Solar System besides Earth. Mars now overshadowed everything at NASA.

The local congressman, Jim Moran, had been an outspoken critic of the space station and wanted to kill it. The previous year, Space Station funding had passed congress by just one vote. It was now up for a vote again. Congressman Moran, impressed with our mission after a tour I had guided for him, told Goldin he would vote for the Station if Goldin would approve a Mars Clementine. This time we learned from our previous mistakes and enlisted the planetary science community. We would fly all the MO instrument spares on two Mars Clementine buses. The new Mission was called Mars MAX for (Magnetospheric and Atmospheric eXplorer), a name I picked out myself.

Flushed with our success at the Moon, we Clementine scientists all went out to dinner in Arlington with a high ranking NASA official. We were hoping to get some hints about the real political situation at NASA HQ. The high ranking NASA official praised our success and said that NASA was interested in employing our talents somewhere else in the solar system. “You should think about the planet Mercury or the Asteroid Belt,” he suggested, two then-unexplored science targets. After a long silence around the table, I spoke up.

“Mercury is pretty hot sir, and the Asteroid Belt is pretty far from the Sun for Solar power. So how about Mars? All we need is bigger solar panels on the Clementine bus and some heaters for the instruments.”

“Mars,” he said, as if talking to himself. “Mars could be a little problematical.”

The battle over Mars was even more desperate this time. JPL now had its sights on NRL, who was now in the deep-space probe business, and JPL wanted them never to be a threat again. They had unleashed the Planetary Society to lobby against NRL, saying that a Defense Department Laboratory was ‘weaponizing space’ by its missions. I got angry phone calls from the Planetary Science Office at NASA. However, I was delighted to hear that the Planetary Society was now lobbying for the very Space Station they hated, in

order to deny our congressman leverage. But finally I checked two numbers, one was JPL's Budget at 1.5 Billion per year and the other was NRL's budget at ¾ of a Billion dollars. This gave me pause.

I told my bosses, that we might have to settle for just another trip to the Moon, with some microlanders, in return for giving up Mars.

Then the Clementine mission spacecraft, after performing its mission flawlessly at the Moon, was shifted in orbit so as to be flung out of the Earth-Moon system to chase an asteroid. However, Clementine suddenly suffered a software failure and its computer crashed while it was moving to swing by the Earth for a gravity assist. Clementine's systems had reacted to the one last cry of gibberish emitted by the crashing computer by firing its attitude adjustment thrusters to spin itself up like a top, halfway between the Moon and Earth. Some on the team even charged JPL sabotage, but it appeared after investigation that it was a simple software error that triggered the computer crash.

In a classic example of Murphy's Law in action, the many safety algorithms in place to prevent such an accident had all run on the main computer, which had then crashed and rendered them all useless. I was called in my role as trouble shooter for the mission manager and succeeded in spinning down the Clementine by firing its main engine. I had truly become a 'rocket scientist.' However, Clementine's mission to the asteroid was canceled and the crippled spacecraft was redirected to merely orbit the Earth as it was spun-down. Unfortunately, as it spun like a top, its solar panels were locked in position by centrifugal force and their orientation to the Sun was also locked by the gyroscopically – locked orientation of the spacecraft. Clementine began to suffer a power shortage.

In any case, the Space Station Vote occurred and it passed by 30 votes. By endangering JPL's death-grip on Mars, we had at least helped save the Space Station Project. However, as I had predicted, a truce was arranged, and the Planetary Society agreed not to oppose a Clementine 2 mission to the Moon, if we dropped our Mars MAX mission. The deal was done.

However, we had made JPL sweat for a while, and they remembered it. NRL was slowly stripped of its ability to launch future deep space missions

on the rationale that it was unfairly competing with the big Aerospace contractors.

Later, the Clementine 2 to the Moon was funded, but, in the historic 'one-and-only' exercise of the line-item veto, President Clinton searched through the massive defense budget and crossed out the Clementine 2 funding. In space, we all play for keeps.

In the late 1980's, a new front in the war of ideas on Mars had opened up. Mars was sending us free samples. These were Mars meteorites, and these meteorites told us that Mars was more Earthlike in the past. All meteorites, as it turns out, start out as subsurface rock protected from cosmic rays for most of their existence below the surface of a larger body, such as the Moon or an asteroid. An impact on the larger body ejects the meteorites into space, where they are exposed to cosmic rays. The cosmic rays make damage tracks in the rock, telling us how long the rocks have been in space. The meteorites, after wandering for several million years in space, end up falling to Earth.

Mars meteorites were originally of unknown origin, but had been grouped together because they were all composed of lava that was geologically young, 1 billion years or less in age. There ages were determined by radiometric means, that is, by nuclear isotopes. The same tests revealed that other lava meteorites were all 4.5 Billion years old. One of the most important tests of rock ages was the potassium-argon method. Potassium 40 is a naturally occurring radioactive isotope of potassium, and decays into argon 40, with a 1.5 Billion year half-life. The Mariner 9 and Viking probes had found volcanos on Mars with fresh un-cratered lava on their summits. This meant that Mars was the one place in the Solar system where geologically young lava might form. Scientists in the late 70's and early 80's began to suspect that the group of meteorites with anomalously young ages were from Mars. They began to wonder if Mars might be sending us free samples. A scenario was imagined: the asteroid belt next to Mars would supply a big rock to hit Mars; the resulting blast would eject small rocks into space that would eventually fall on Earth.

Oxygen is the third most abundant element in the universe and combines with everything. The rocks themselves are comprised of oxygen in combination with various metals and silicon. All the suspected Mars

meteorites had the same pattern of oxygen isotopes. Thus they were truly from the same place. However, what really helped in the identification of Mars meteorites were the isotopes of xenon 129 and 132. On Earth, in the Solar wind, and on Jupiter, three major solar system reservoirs that are well measured, xenon 129 and 132 are almost equal in abundance. However, on Mars, xenon 129 was 2.5 times more abundant. When rock samples from the suspected Mars meteorites were crushed, xenon gas was released, and its abundance ratio of xenon 129 and 132 isotopes matched Mars. But if the lunar Mars model was correct, if Mars had simply been bare rock for most of its geologic history, then the suspected Mars meteorites were still not connected to Mars. A lunar Mars might have a few volcanos, but was mostly primordial rock, and even if it has an atmosphere with a lot of xenon 129, its presence in the lava meteorites meant nothing, since no mechanism existed to get the xenon into the rock.

An additional assumption about Mars was necessary if the suspected Mars meteorites were to be paired with the Red Planet: the assumption that Mars past was terrestrial. Many suspected meteorites had been found, all geologically young. Mars had to be geologically active, with lots of volcanic activity across its surface to produce a lot of young lava deposits on the surface. But Mars had to be even more Earthlike still. To transport xenon gas from the atmosphere, rain and snow were required, what is called a hydro-cycle, so that dissolved gasses from the atmosphere would be transported to the surface, go into ground water and soak the rocks below the surface, thus introducing xenon gas into them. Thus, in order for Mars to be the source of the meteorites, Mars had to have been active geologically and have a hydro-cycle connecting the atmosphere to the gasses trapped in the rocks. Mars' past had to be terrestrial for the meteorites to be from Mars. As I discussed in my book ***Life and Death on Mars:***[3]

> "The Phoenix is a bird that dies in fire and then rises from its own ashes. In Japanese culture the Phoenix is known as the Vermilion bird (Suzaku), and is associated with Mars. Like the Phoenix, Japan had risen from the ashes of World War II. By the later 1960s it had quietly resumed its place among the foremost scientific nations on Earth and established a research station in Antarctica near the Yamato Mountains.

In 1969, a Japanese team in Antarctica discovered a trove of meteorites in the ice at the end of a glacier. Antarctica, it seemed, had been collecting meteorites falling from the sky on a moving conveyor belt of ice, a glacier, and then dropping them at the foot of a mountain range like a hamster storing seeds for the winter. Among these meteorites were many familiar types, for meteorites belong in families, grouped according to minerals and isotopes.

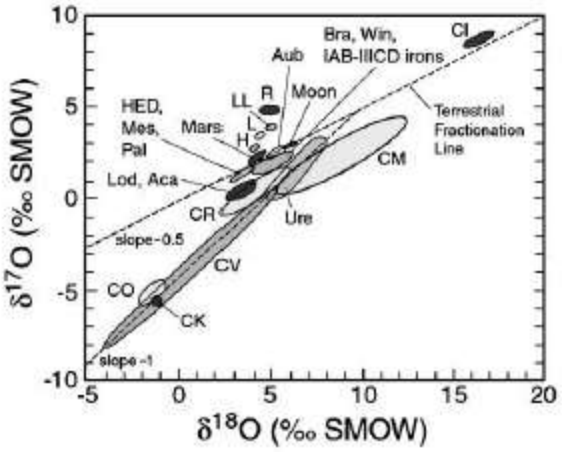
The Phoenix reborn

Some of the meteorites that had been found in Antarctica however, were of a very strange type, for they matched closely rocks brought back from the Moon. That is in fact where they were from. This demonstrated that meteorites could come from a large planet- like body, not just be blown off a small asteroid. This made people look with new eyes at a small grouping of meteorites that had perplexed experts for decades.

Collection of a meteorite in Antarctica (NASA)

Meteorites are named from the places where they have fallen. Accordingly, a meteorite that fell in Chassigny, France, acquired that name, so likewise did the fatal meteorite that fell in Nakhla, Egypt, and finally the one that fell near Shergotty, India. These three meteorites were thus called the SNC (Shergotty Nakhla Chassigny) meteorites. They not only had similar mineralogy, but similar isotopes.

Oxygen occurs in three stable isotopes, of atomic weights 16, 17, and 18 units, and the ratio of these among each other is like a mathematical fingerprint. Oxygen 16 is the most abundant isotope so it is used as a reference; the ratio of the abundance of oxygen 17 to the amount of 18 is what is key. Using oxygen isotopes, one can plot a map and place everything that falls out of the sky on it. Meteorites form tight clusters or lines on such a graph when the 17 to 18 ratio is plotted.



Oxygen isotopes of meteorites (JPL/NASA)

On this graph everything on Earth lies on a line running at a constant ratio of 1: 2.24 of Oxygen 17 to 18 abundance through the point 1, where 1 is the terrestrial fractionation line. Everything found in nature on Earth falls on this line, from the sea and land. Rocks from the Moon also fall on this line, confirming that the Moon was not captured as it roamed around the early solar system, but was made from the same isolated pot of molten rock as the Earth. The Moon rocks all sit at one point on the line because there is no liquid water on the moon. It is the interaction on a molecular level between liquid water and minerals that smears the oxygen coordinates of Earthly rocks and minerals into a line rather than a point like the Moon rocks. Water contains oxygen like the rocks, and has the remarkable property that it “swaps” oxygen with minerals, and does so in a manner that favors the lighter and swifter oxygen 17 consistent with its mass difference. Thus, the slope of the line. Minerals with lots of interaction with water, weathered clays and water-deposited limestone, all have “lighter” oxygen dominated by oxygen 17 and thus lie higher up on the line from dry volcanic basalts. On Earth, the water and rock, the two great reservoirs of oxygen, share the same fractionation line because of plate tectonics, where surface rocks are pulled down into the bowels of the Earth with the waters of the ocean, crushed and heated together so that the oxygen atoms mix between them completely. They are then both, as steam and lava, shot back up to the surface from volcanic vents or summits with the same isotopic signature.

It is a glorious and mysterious thing to look at the oxygen isotope map of all things that fall from the heavens. The map is dominated by lines and clusters, most wrapped in mysteries dating from the foundation of the world. The terrestrial fractionation line dominates the map; another line runs nearly up and down the map. This is the CAM (calcium aluminum magnesium) line for the toughest, oldest pebbles in the solar system, recovered from the type of meteorites called chondrites, from Greek meaning “seeds” because of their welded-together pebble-like structures, which are impact shock-welded conglomerations of a grab bag of dust and minerals in the primordial chaos of the early solar system. Forming small regions on the graph above the terrestrial line are the L and H chondrites.

There are other clusters whose meaning is slowly emerging or remains enigmatic. Clusters or lines are thought to represent samples broken off a single “parent body” and carried to Earth after surfing various gravity fields, or even running into some small wandering chunk of rock. One group called the eucerites has been traced recently to the asteroid Vesta in the asteroid belt. Another mysterious group lies precisely on the terrestrial line and is called enstatites; however, they are from some utterly unearthly place. They look like a jewel-studded crystal pulled from some furnace in the heavens. In all this mystery, the group of SNC (Shergotty, Nakhla and Chassigny) meteorites and their cousins lay in a cluster just above the terrestrial line.

The people who study meteorites are called meteoriticists, a breed apart from planetologists, who are used to gathering information on what they can see every night in the sky but can never touch. Meteoriticists are people used to handling pieces of stone from unknown places and trying to figure out what those places are like from the rocks they have sent us. Unlike the planet people, who have flashy missions and tend to hold news conferences, the meteorite people tend to attend conferences and go to Antarctica to gather interesting rocks. The meteoriticist people spend long hours staring through microscopes at thin slices of rock specimens. Planetologists study the big stars roaming the night; meteoriticist people study streaks of light that are gone in a heartbeat. But all of that was about to change.

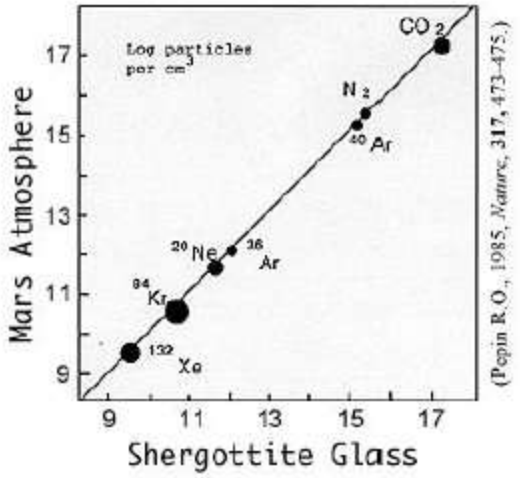
The SNC group had been noted, and grouped together by meteoriticists, for decades for being young lavas, ranging from 1.3 to 0.3 billion years old.

These ages were determined by radio-isotopic methods well proven on Earth. Many meteorites look like lavas; however, they are all approximately 4.5 billion years old, and thus date from the formation of the solar system. Even the youngest lunar lava meteorites from the Moon are 3.2 billion years or older in age. From the SNCs it could be seen that some place in the solar system was throwing rocks at Earth, and that place had volcanoes that were recently active. Also, the place had to be close, because the meteoritic people could tell from cosmic ray effects that the meteorites had been flying around in orbit for only a few million years, a shorter time than many other meteorites that were believed to come from the Asteroid Belt. Somewhere, a planet-sized body with volcanoes, was blowing smaller rocks back into space, so they would orbit the Sun in a few million years and end up falling on Earth. Venus seemed unlikely because it had powerful gravity like the Earth, a dense atmosphere that would make escape from its surface very difficult, and was closer to the Sun, making rocks ejected from it unlikely to move outward in orbit to Earth. With a combination of logic and astute observation that would impress Sherlock Holmes, some meteorite scientists in the late 1970s arrived at a startling hypothesis: The parent body of the SNC meteorites was Mars.

From Mariner 9 and Viking probes it had been learned that Mars had young volcanoes. This was evidence that the SNC were Martian but something more compelling was required to prove it. Fortune smiled on the meteoritic scientists in Antarctica, in 1979, in the newly found meteorite gathering fields. A meteorite was found at a place called Elephant Moraine. The meteorite was cataloged as ETA979001, ETA standing for Elephant Moraine, 79 for the year and 001 marking it the first meteorite of that year.

The meteorite turned out to be the “Rosetta stone” of Mars, for, trapped in the obsidian-like melted rock that formed part of it, were bubbles of gas. These gases were analyzed for isotopes in 1982 and showed the same remarkable xenon 129 excess and argon 40 excess that had been found by the Viking landers on the Martian surface. Soon other SNC-type meteorites were tested in this fashion. Finally, by 1985, a consensus formed, the young lavas with lots of argon 40 and xenon 129, were samples of Mars, blown clear to Earth by meteor impacts on Mars. It was a stunning and marvelous discovery. Nature had provided free of charge what planetologists had only dreamed of

getting after an expensive and complicated space mission: samples of Mars.



Comparison of Mars atmosphere with gases trapped in a Mars meteorite (NASA)

Mars, declared dead in 1979, was suddenly enticing and beckoning humanity again, five years later. It was not only showing signs of life, it was serving us appetizers. The free samples were tasty indeed. The mineralogy of the SNC group was neither simple nor predicable. They hinted at origins in a rich and highly evolved geologic system on Mars. The lavas that made up the SNC group were varied, ranging from iron-rich basalt similar to that from the volcanoes of Hawaii; these were the Shergottites. But the Nakahlaites were rich in calcium, and Chassigny was nearly pure peridot, an emerald green semiprecious gem, known to geologists as Olivine. Strangely, the rocks were low in potassium, uranium, and thorium compared to average Earth rocks, and they had substantially more iron. This contradicted the seemingly reasonable results of the Mars spacecraft sent by the Russians. More meteorites from Antarctica and from the Sahara were found that belonged in the SNC group. The buffet of free samples from Mars was increasingly varied and strange.

The SNCs had many unexpected properties. They were all geologically young, with radiometric ages ranging from 0.18 to 1.3 eons old. Their relative youth had connected them to Mars, but few scientists thought of the implications when making this connection. All of them were young, not just

some of them, and this suggested that Mars was a deceiver, for it looked old, dead, and battered, but the SNC said that parts of it were young and dynamic. The rocks also had another intriguing property; they had water-deposited minerals in them, and these crystals of gypsum and carbonate had to be young also.

Groundwater had to be moving around on Mars, below the surface. The rocks had water trapped in them, a few drops per kilogram, and this water told of unearthly things. With slightly more oxygen 17, the water oxygen isotopes were lighter than the rock in which they were embedded. All the SNCs contained lighter water oxygen. This confirmed the Viking imagery which had shown no evidence that plate tectonics had operated on Mars like on Earth. So Mars rock and water had kept a separate oxygen signature. The waterborne minerals were much different in their oxygen isotopes from the rock. Also, they were smeared out from the rock on a fractionation line similar to the terrestrial line, but the line was above and parallel to the terrestrial line. Mars had its own line. This meant that like Earth, Mars had been a system of geology and water moving and interacting. The young age meant that this had been true recently in geologic time, as recently as 180 million years ago, at the time when Jurassic age dinosaurs, like the Stegosaurus and the Allosaurus had ruled the Earth.

The SNCs told further of oxygen on Mars. Substantial iron minerals in them were not the normal ferrous or low oxygen state, which is black like basalt, but in the high oxygen state called ferric, which is red like hematite. The rest of the minerals, especially the waterborne minerals were all high oxygen states. It was as if the ground water of Mars had been on the surface, and been exposed to oxygen there, before sinking into the rocks. Earth’s soil is highly oxidized; it contains several atmospheres worth of oxygen, if it were heated and the oxygen driven back into the air. The same can be said of Mars. The Vallis Marineris exposes sediment 8 km thick, and they are all light red colored and therefore highly oxidized. It has been argued by some that the walls are simply dusted with windblown red dust, but the fact that dark low oxidation state lava deposits can be seen on the Vallis floor shows this is not the case, for they are not covered with dust and they are lying flat, while the walls are vertical. Therefore, Mars is oxidized in depth, not just on the surface. This means that the surface conditions were oxidizing when the

sedimentary layers were laid down eons ago. Mars is highly oxidized all over its surface also, with only a few dark areas of lower oxidation showing.

This was strangely in agreement with the Viking results, where not only was the soil bright red and full of hematite, but it even exhaled oxygen when water was applied to it. These things were seen in the rocks by meteoriticists and recognized because they were familiar; the Earth had rocks with similarly highly oxidized minerals. But the meteoriticists shook their heads quickly: Such comparisons were dangerous and probably misleading, for Earth had an oxygen atmosphere. It was probably misleading, because the rocks were from another planet, whose geologic history was unknown, and it was dangerous because it suggested life. Meteoritics had suddenly been rocketed to center stage, on Mars, that most treacherous of worlds. The meteoricists, being by nature cautious people fond of rocks, did not want to do anything to spoil their moment of fame.

To be a meteorite specialist had become cool; they were now being invited to parties. They had become planetologists, and planetologists of no mean parent body, but the most fascinating planet of all Mars. Like any sample of something that has only been observed remotely, the SNCs were both confirming and overturning ideas about Mars from the Vikings. The impact of the SNC on Mars studies was electric and unfolding. It contributed strongly to a Renaissance of Mars in the mid-80s that gathered steam as the Cold War was ending. Not only did it suggest that Mars was a dynamic and water rich planet in the past, as had been found by the Vikings, but it suggested that this activity and the planet’s surface itself were both recent. But the most telling shock was yet to come.

The SNCs contained other things besides minerals: Mars was showing life signs. In the minerals of the SNCs were traces of organic matter, the stuff of life. The meteorite where these were found in largest concentration was ETA79001, the Rosetta stone of Mars and also one of its youngest. The Nakhla meteorite also contained substantial organic matter. The verdict of a lifeless Mars during the Viking missions had been based on the absence of detectable organic matter on the Mars surface. This report from the meteoritic people made that verdict look hasty and hollow. The organic matter was found in highest concentrations in a vein of water-deposited minerals found

in the center of ETA79001.

Organic matter is part of the primordial stuff of the solar system. It is found in other groups of meteorites called carbonaceous chondrites. These meteorites are considered very primitive remnants made of the dust that formed the planets. They are very ancient, 4.5 eons old. Because of them, it was commonly believed that organic matter was part of the original ingredients of Earth, Mars, and the other planets in our solar system. But this ancient organic matter did not mean life; it was simply its as yet dead building blocks. Such organic matter would have been oxidized and burned up by ultraviolet energy in the Mars environment long ago. Therefore, finding organic matter in a meteorite was not considered startling, but finding it in a meteorite from Mars was, especially one that was young.

The Mars enigma deepened as more meteorites were gathered and a steady stream of new SNC types were found. The meteorites were still bouncing in ages between 180 million years in age and 1.3 billion years, a younger range than expected. The meteorites came from multiple impacts on Mars, known because their space exposure ages from cosmic ray tracks were in several clusters. This result, combined with the young ages, suggested that a large part of the Martian surface was younger than it looked based on crater counting. However, the deepest problem was the absence of any older ages. Mars had a dichotomy: that the north hemisphere was young could be accepted, but the south was perhaps 4.5 billion years old. Why were no southern meteorites being found? A partial answer came quickly.

In 1984, in Antarctica, a team looking for meteorites spotted a greenish lava looking rock lying in the snow. The team picked up the intriguing rock and later found it was indeed a meteorite and gave it the name ALH84001. It looked less interesting back in the lab than in the snow, and was classified as a Diogenite, a curious but obscure group of lava meteorites, and put on a shelf. However, a worker named Middelfelhdt, looking through the old meteorite collections, found its greenish color intriguing. He analyzed it carefully, and based on years of experience, realized it had been misclassified as a Diogenite. Based on chemistry and mineralogy alone, he boldly proclaimed it was Martian and belonged with the SNCs. This was quickly confirmed by oxygen isotopes. The real shock came quickly: its age was 4.6

billion years old. An old Mars meteorite, perhaps from the ancient southern part of Mars, had finally been found. A frenzied check of old lava meteorite collections was made, with the hope that the misclassification of ALH84001 meant that other ancient Mars meteorites had been misidentified. Alas, the misclassification of ALH84001 was apparently a fluke.

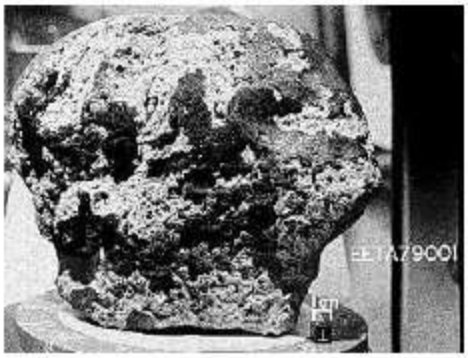
ALH84001 was a sample of primordial Mars, apparently the only one in collections. Because, at that primordial time Mars and Earth were assumed to have been similar in surface conditions and atmosphere, it seemed only reasonable to see if Mars had held biology as Earth apparently had held it. The results of this investigation stunned the world, for indeed, it appeared that the stuff of primitive life was preserved in the core of ALH84001, in a seam of carbonate rock apparently deposited by water. The sense that this was a forbidden result soon settled in, and an angry mob of scientists attacked the ALH84001 biology results. As one scientist from the ALH84001 life-group told the author: “we understand their criticisms, but not their anger.” The ALH84001 scientists responded with evidence for life found in other Mars meteorites, such as Nakhla, but it did no good.

The old mindset of life-never-being-the-simplest-hypothesis awoke in full fury. A dozen arcane non-biological scenarios were invoked to explain the collection of chemical and morphological features found in ALH84001. As soon as one such non-biological mechanism was swatted down another dozen took its place. All of these non-biological scenarios were complex and some outrageously so, but all were entertained, even applauded, because they were all simpler than the simplest living cell.

Some scientists recalled a previous report of microfossils seen in a group of meteorites, called CI carbonaceous chondrites that had been shouted down in the 1960s. These life-signs had been dismissed as terrestrial contamination. Those who recalled this affair, said that any meteorite that fell to Earth was by definition contaminated by the biology of Earth, and could not be used to prove anything about extraterrestrial life. One would have to go to Mars, and bring back rocks in a sterile container, it was said, to ever prove the proposition that life had existed on Mars. The planetary community finally shrugged its shoulders, and said that the life evidence in ALH84001 and the other Mars meteorites, such as Nakhla, was “not compelling.”

While the life debate raged, the collection of Mars meteorites continued to grow and enrich itself, forming its own subgroups of age and mineralogy; however, ALH84001 remained the only ancient Mars meteorite. The range of ages between the Shergottites, which tended to be 180 million years old, and the Nakhlaites and Chassigny, which were 1.3 billion years old, was filling in with the discovery of meteorites of intermediate age. However, the “age paradox” deepened.

The Mars Age Paradox was two-fold: 1. The group of young meteorites was younger than expected even if all came from the young half of the Mars dichotomy. 2. Half the expected Mars meteorite collection was missing, the old half from the old part of the Mars dichotomy. The fact that one ancient meteorite had been found from Mars made the mystery even deeper. The statistics were totally wrong for young and old contributions to the collections. The statistics suggested that large areas of Mars were young, and that the obviously old areas of Mars were not producing recognizable meteorites.



ETA79001: The Rosetta Stone of Mars, the first proven Mars meteorite (NASA)

A solution to the first part of the paradox was found. The difference between the ages of the meteorites and ages of the surfaces they came from was found to depend on one unknown parameter, the cratering rate on Mars. The meteorite ages could be measured directly and were assumed to be rock from a layer near the surface that was “sampled” by being sent into space when a large asteroid impacted Mars. However, the surface age of regions of Mars was an estimate, based on an estimated rate of meteorite bombardment

on Mars compared to the Moon. This was the unknown parameter. It had been proposed that the cratering flux on Mars was between 1x lunar and 4x lunar, with 2x lunar being the best estimate. So the cratering flux on Mars was assumed to be enhanced by Mars's proximity to the asteroid belt. It was proposed by the author in 1996 that the meteorite flux on Mars was actually much higher than estimated, at least 4x lunar. This suggestion was also made by Nyquist, in 1998.

If the meteorite flux was 4x lunar or higher, the ages of much of Mars's northern regions became younger, and the regions between 1.3 billion and 180 million years old became a much larger percentage of the northern area of Mars. This idea had also been proposed by Nyquist. So the first part of the age paradox could be solved by adjusting the crater rates on Mars. Such a high cratering rate would also explain why so much more Mars material, kilograms, has been recovered on Earth compared to the relatively small amount of material, a kilogram or less, than has been recovered from the Moon meteorites. Given the great distance of Mars and higher velocity to which fragments must be accelerated to escape Mars gravity in order to reach Earth, as opposed to those from the Moon, the cratering rate on Mars must be much larger, perhaps an order of magnitude, in order to create this excess of Martian material. Mars is apparently being hammered by the nearby asteroid belt.

The second part of the age paradox, the missing old meteorites of Mars, had an even more startling solution that remains controversial. The meteorites from Mars, including ALH84001 and all the SNCs, had been lavas. The frantic searches for missing Mars meteorites in the collections had concentrated on lavas. The only other types of meteorites were chondrites, and it was thought that they couldn't be from Mars. The chondrites were the right age, 4.5 billion years, but they were made of space debris of all sizes, shock-welded together by impacts. As strange as Mars was, it was not outer space; it was a planet with an atmosphere that slowed things down, especially small things. But meteorites had always been classified as chondrites, or achondrites. Achondrites were melted, semi-homogenous rocks like lavas; chondrites were completely heterogeneous mixtures of rocks that had never melted together and mixed. The puzzlement in the meteoritic community deepened with the discovery of every new young lava from Mars.

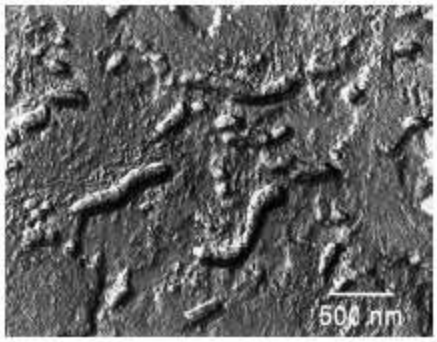
ALH84001, still the only ancient meteorite of Mars, holds signs of life (JPL/NASA)

That the missing meteorites were already in the meteorite collections seemed highly likely. They were most certainly hiding there, because the process of ejection of Mars rocks seemed to be flinging rocks to space from Mars, and hence to Earth, without shattering or melting many of them in the process. ETA79001 had had a rough ride from Mars, and was partly melted because of it. Nakhla, however, looked as if it had ridden here on a silk cushion. No evidence of shocking or melting could be found in Nakhla. This meant, among other things, that the process that flung rocks into space from Mars could bring a wide variety of rocks here. No one could think of a good reason that old rocks from Mars should not be sent here as well as young ones. ALH84001 had showed that old rocks from Mars seemed to get here by the same process as new ones. The question was then asked, what would a piece of the old surface of Mars look like? Would it be lava or perhaps a sedimentary rock?

The southern highlands of Mars were covered with old water channels, and the process of erosion had wiped out all craters smaller than 30 kilometers in diameter. That is a lot of erosion. Such erosion would create clay and mud, and the mud would be on the bottom of lakes that would form in craters, and then the mud would harden when the water dried up. The rock would look like shale or adobe. Could such rock survive being blasted into space from Mars? Was it possible that the missing meteorites of Mars were not lavas, but something else, perhaps something that looked like old lake bottom? The answer to this puzzle lay on the oxygen isotope maps of meteorites. The answer was so stunning to meteorite specialists that they initially recoiled in astonishment. The answer was forbidden.

The proposal by the author in 1996 that so stunned the meteoritic community was that the missing old meteorites of Mars were sitting in glass cases in museums, a few feet from the other Mars meteorites. These were the same meteorites that had caused a bitter life-debate in the 1960s.

The Orgiuel Meteorite

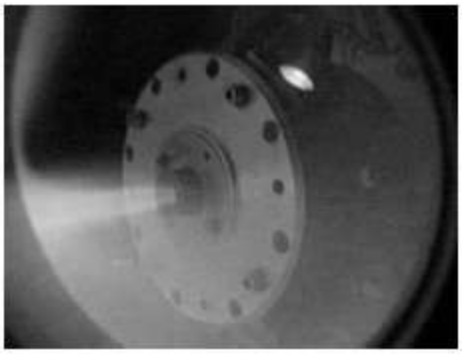


Possible Microfossils in ALH84001 (NASA)

They were a rare type called CI carbonaceous chondrites, and they consisted not of lava, but of hydrated clay. They were in a sense achondrites, because they have no chondrules, but classified as chondrites nonetheless because they were not lavas. The isotopes of oxygen and other gases matched Mars well, and they were 4.5 billion years old, and there were a dozen of them, about the same number as

the SNCs. Therefore, they indeed looked like they could be the missing old meteorites of Mars. The suggestion they were Martian ignited a firestorm. It did not matter that the CI shared numerous properties with the other Mars meteorites, one thing made them unacceptable as Martian: They were full of organic matter and microfossils. If the CI were Martian, then Mars had been alive, and this was unacceptable."

I had successfully made a transition in my career by the mid 90's, from being a plasma physicist, to being a space scientist, a transition I had made because of Mars. However, plasmas are part of space, so I relentlessly looked for an opportunity to combine my two loves : space and plasma physics. I finally succeeded in obtaining funding to help develop, with Michael Micci of Penn State, a new plasma thruster for space called the MET (Microwave Electro-Thermal) thruster. After a year of intense development in a joint program with Penn State, we had succeeded in making the MET into a compact, efficient device suitable for flight in space. The MET used a vortex stabilized electrode-less microwave discharge to heat gases for propulsion. It ran well on a variety of gases, but one day I tried simple water vapor and it worked beautifully. Water vapor formed stable plasmas of a beautiful blue-white color in the MET. [5]



MET thruster firing in vacuum

Water, found on the Moon and Mars, would be the ideal propellant for the MET since the spacecraft sent either of those places using this engine could refuel at its destination. The electric power to make microwaves for the MET could be made with simple large Solar power arrays, or with nuclear reactor.

The industrial microwave tubes for a large MET engine, suitable for a Mars mission, operated at an astounding 95% electrical efficiency. Finally, we were able to measure the specific impulse, the “bounce per ounce” or exhaust velocity, of the water vapor used as propellant for the MET. The results were stunning, after repeated tests, the water vapor was found to have the perfect exhaust velocity for a Mars mission, approximately 9 kilometers per second. I had a deep feeling of destiny wash over me when I saw the number for the first time-this was the same exhaust velocity as the baseline Mars mission propulsion, the NTR (Nuclear Thermal Rocket) or NERVA engine using liquid hydrogen. So had succeeded in rivaling the much more complex and expensive NTR with a simple engine that could run a Mars mission off of the same Solar array that runs the Space Station. We immediately rushed off to some Mars conferences and published these results and proposed a Solar Electric Mars mission architecture around the water-MET as a main mission engine. I obtained a patent on the MET with water propellant. Somehow, in a way I could not imagine, my scientific career was now described as “Mars rocket scientist.” Also, using my new contacts at NASA I managed to revive two promising “table top” fusion concepts using NASA funding. One was the IEC (Inertial Electrostatic Confinement) device, and the other, which I managed myself, was the TRISOPS or CMTX (Colliding Micro-Toroid eXperiment) which was very successful[6] and became the “magnetized target fusion “approach.

I found myself at another Mars conference, this time in Texas, and I pointed out that the young ages of the Mars meteorites required that large areas of Mars had to be geologically young. The ages of Mars terrains were estimated by assuming a cratering rate on Mars, usually 2x that on the Earth’s Moon, and then counting craters per square kilometer. I pointed out, being a physicist, that the average age of the Mars meteorites was much less than the estimated age of the Mars surface, but that by adjusting the one unknown parameter, the Mars cratering rate, one could erase the difference in average meteorite ages with estimated surface ages. One merely had to assume a Mars cratering rate of 4x Lunar or greater. Mars was next to the asteroid belt, it made perfect sense that its cratering rate would be higher than the Earth’s Moon. [6]

This idea was well received, and picked up by others. However, in one

telling conversation, another Mars scientist approached me and told me.

“The others told me not to talk to you because you’re connected to Cydonia, but I want you to know your idea about adjusting the assumed cratering rate is really awesome, and I wonder why I didn’t think of it.”

The community has indeed picked up this idea of a young Mars surface, and like the paleo-ocean concept, they do this without giving me credit.[7],[8] But this is OK; it is the ideas that are important. Credit I can get from a bank, scientific progress is priceless. What is important is the fact that Mars’ past is changing from the Lunar Mars model to a Terrestrial Model.

I had read of meteorites with large amounts of organic tar in them, like oil shale, and also microfossils. These meteorites were called CI Carbonaceous Chondrites. [9] Because of Cydonia, I was certain Mars had once been a living planet like Earth. It therefore, seemed only natural to check to see if these CI meteorites were from Mars. Finding out from the literature that Mars meteorites had an oxygen isotope ‘fingerprint “, and plotting along a line parallel to rocks from Earth on an oxygen isotope graph, I found a book that had a graph showing the various types of meteorites on the graph. There were Mars meteorites and Earth rocks, along with various other types of meteorites, but I could not find the CI meteorites. I was fairly shaking with excitement and frustration, and then I turned the page. The first graph had cut off at certain oxygen values. The CIs were on the second value at elevated values of oxygen 18 and 17 isotopes. I was delighted to see the CIs were slightly above the Earth-rock line. If one extended the Mars meteorite line it went right through the CI data. By simply extending a line with a ruler I had found another whole group of Mars meteorites, and more than that, because the CIs are 4.5 billion years old they had proved life existed on early Mars.

After a long struggle I succeeded in getting the CI from Mars article published.[10] Mars meteorite experts were very angry with me. I think it was because they did not want to find life on Mars. One of then called me up and yelled at me over the phone, saying that what I had done was “not science!” This CI-Mars hypothesis has now been confirmed by data from a new Mars meteorite, NWA7533 that is also 4.5 billion years old, and whose water content, like the CI, is very high.[11]

I was serving on a committee down at NASA headquarters on space transportation, just after I had been informed that the CI article had been accepted for publication. Dan Goldin was the NASA administrator, and we were informed that he would show up at our committee meeting. After asking the committee chairman for permission, I informed Dan Goldin of the new meteorite results and their implication. He was transfixed, and I gave him a copy of the article which he took eagerly. Two months later, the world was electrified by the announcement from NASA that life signs had been found in the Mars meteorite ALH84001.[12] Vince and I were at NASA HQ in the auditorium for the press conference, complete with Dan Goldin wearing cowboy boots and introducing all the scientists involved. When the press conference was done, he stepped off the podium, walked up to me and shook my hand. I was very proud. I believe my article convinced him that signs of life in Mars meteorites would soon be confirmed by my CI discovery, and this had given him the confidence to trumpet the Mars life findings in ALH84001.[12] This all had the effect, of course, of making Mars even more interesting.

The scientific community as a whole was quite hostile to the Mars life findings in ALH84001, however, and also to my findings. Just like the priesthood of Zeus and Aphrodite had locked up Anaxagoras in ancient Athens for saying that the Sun was merely a fiery mass of rock at a great distance, their remains in human beings an impulse to guard the geocentric view of the cosmos. We may not be the geometric center of the universe, but to a certain faction in the scientific community we remain the center of the biological universe, the masters of the only oasis in the vast desert they imagine to be the cosmos. The debate over evidence of life in Mars meteorites is thus the opening shot in the “Second Copernican Revolution”, the recognition by humanity that we are not the center of the universe biologically. However, for some Earth remains the only abode of life in the universe. This faction will defend this position until death or retirement.

At one meeting, after a heated session, complete with people jumping up and shouting objections to the speakers, including myself, I spoke with David McKay. Dave was the leader of the group at NASA Houston that had discovered the ALH84001 life signs. I had seen him endure furious opposition from other scientists at his talk, and he told me “I can understand

their criticisms of our work, but I cannot understand their anger." He and I both were encountering the special brand of hostility reserved for those who try to change the human place in the cosmos. Unlike Aristarchus of Samos, Copernicus or Galileo, who moved Earth from the center of the universe in the geometric sense, we were moving Earth from the center of the universe in the biologic sense.

So it was, that many years after MO and Clementine, Mars was enshrouded in controversy, with me on its front lines. The ranks of the Cydonia investigation had grown strongly, much helped by the work of Mark Carlotto, Stanley McDaniel, and Horace Crater. These men had formed an organization call SPSR(Society for Planetary SETI) and they had invited me to join. I was deeply honored.

Stanley McDaniel had authored a scholarly book ***The McDaniel Report,*** which blasted NASA and particularly JPL for its handling of the Cydonia controversy.[13] McDaniel was an academic speaking eloquently to Academia. Here the strength of Academic Science versus Defense Science was displayed: the fact that Academia is detached and strives for objectivity and careful investigation, whereas we in Defense Science are concerned only with goals and results. To say "the matter is now Academic "is often statement in Defense Science that the matter has become unimportant. However, it is really a statement that 'this matter can't be settled in this project's timeframe.' Academia searches for truth, and plays a "long game." Stanley McDaniel made the case that Mars was a 'long game' and that it was being played poorly by NASA. NASA listened, and resolved that more images of Cydonia must be taken.

In 1993, Donald Ecker, then chief researcher for UFO magazine had made a remarkable discovery. Don discovered that NASA, at its formation in the early 1960's, had commissioned a study by the Brookings Institution, in which it was said that artifacts created by extraterrestrials would be expected to be found on the Moon or planets.[14] Thus, the possibility of finding artifacts on Mars was 'imbedded into the DNA' of NASA from its foundations. The report suggested that evidence of such artifacts might be suppressed for the public good. However, the existence of such a NASA suppression policy was hard to argue in the midst of the still raging controversy over the images from

Cydonia. One would have to assume that the government was both attempting a cover- up but was also hopelessly incompetent. However, the US government is not incompetent. Soon a new NASA probe was on its way to Mars, and the moment of truth was looming in Cydonia.

I was preparing rocket engines for the journey to the Red Planet, when finally a Mars probe returned the first new images of Cydonia.

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Chapter 5 “MSSS-led” or “Winning by A Nose”

“This means this thing on Mars isn’t over Vince, it means this thing is barely started”

John Brandenburg to Vince DiPietro, after he was physically attacked by a JPL employee at a 1998 AGU Meeting

Many years had passed before a new probe, the Mars Global Surveyor, assumed orbit around Mars. Dr. Stanley McDaniel and Dr. Horace Crater had formed the umbrella organization called the Society of for Planetary SETI. The movement for scientific investigation of Cydonia had turned into a ground-swell in the scientific community. Carl sadly, had passed away, but his last book; ***A Demon Haunted World*** had urged that Cydonia be further investigated.[1] He was truly a great man, for many works of science and popularization, but I believe history will remember his role in Cydonia as his greatest work. His endorsement, made nearly on his death bed, had been the tipping point, I believe.

I had been presenting and publishing many scientific papers on Mars, and had formally put together what I called the “New Mars Synthesis”, a whole new concept of Mars’ geochemical history from the mass of Mars data from meteorites, probes and rovers.[2]

It was 1998 and I was honored to be sitting in a conference room at NASA headquarters with Stanley McDaniel PhD, Horace Crater PhD, Mark Carlotto PhD and myself, all members of SPSR. Facing us were several of the top managers of NASA’s planetary exploration program. The meeting was very cordial and each of us from SPSR made our case with a 5 minute summary of our reasons for believing that reimaging the Cydonia face was vital to science. We also complained loudly about the conduct and public statements by Mike Malin of the aptly named MSSS (Malin Space Science Systems).

I myself pointed out that Malin was complaining that the kilometer–scale Face was too small to image, while at the same time bragging he was going to use his camera to image the much smaller “Sojourner” rover sitting on

Mars.

“This was quite an ironic juxtaposition of statements,” I said to the NASA managers, who reacted with knowing looks and chuckles. Malin had already been in trouble with the mainstream Mars community for “embargoing” Mars images, and was obviously considered a ‘pain in the ass,’ at NASA HQ.[3] However, he seemed to be playing his role well for JPL.

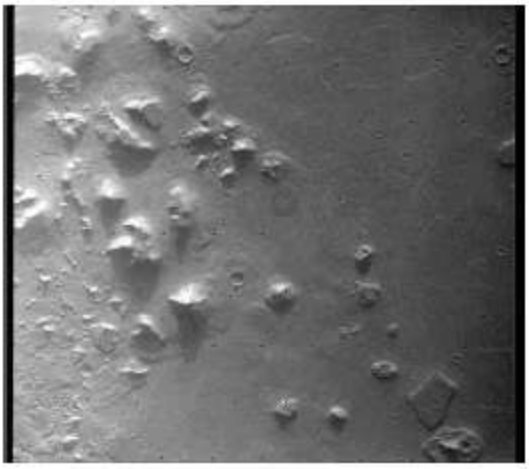
Dr. Horace Craters’ analysis of a set of small mounds around the face and Pyramid at Cydonia particularly transfixed the NASA people because it was entirely geometric and numerical.[4]

Illustrations of the pattern of small mounds found in Cydonia by Horace Crater of SPSR

I summarized my New Mars Synthesis and the Cydonian Hypothesis and noted to the NASA officials that finding a dead civilization on Mars would be the ultimate “soft landing” for the public to realize they were part of a living

universe. Since the civilization was dead, the public would feel much less threatened, I told them. The NASA officials, seemed impressed by the professional and thorough nature of our scientific presentations and agreed to reimage the face at the earliest opportunity. They also said the images, once acquired, would be released immediately and without prejudice.

Unfortunately, we were to find out that, apparently, no one told JPL and its contractor MSSS about this understanding.



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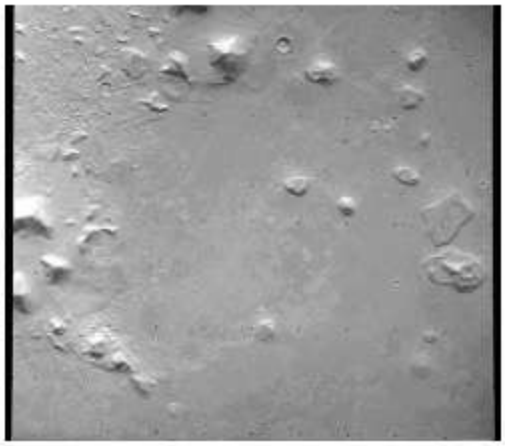

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It can be said the Face of Cydonia has become the great clue to the past conditions on Mars: that it had been Earthlike for most of geologic time,

Earthlike in every way. The Mars on which the Cydonia Face was an **expected** occurrence was a Mars that not only had liquid water, but rapid erosion (at least in the north) and an oxygen atmosphere due to massive photosynthesis. Mars' surface was known by Viking data to be covered with highly oxidized iron (hematite) giving Mars its red color, just like the deserts of Earth seen from space. This view of Mars' past climate, Terrestrial for most of its history, provided a roadmap for analyzing the vast storehouse of Viking imaging and other sensor data. If the Terrestrial model was true, then signs of it would be found everywhere, and they were. The year 1984 was in general a year of great advances for Mars science as the vast mountain of data from the Viking mission was digested. The Lunar Mars Model became threatened since the Viking orbiters imaged many uncratered young, almost terrestrial, terrains with water channels. The summits of the Mars volcanos were revealed to be fresh, as if lava had flowed recently in geologic time. However, one of the greatest Mars discoveries of 1984, indirectly from Viking, was the discovery of the meteorite ALH84001, which would turn out to be from Mars.

The Mars meteorites were identified because of Viking lander data, which had revealed a unique pattern of noble gas isotopes in Mars atmosphere. Viking landers had also revealed that the surface of Mars was rich in highly oxidized iron, consistent with an oxygen rich past atmosphere, and Viking images had shown that the summits of the Mars volcanos had fresh, un-cratered lava surfaces, indicating recent volcanic activity. None of this was consistent with the Lunar Mars model, but instead was consistent with a Terrestrial Model. These pieces of data were consistent with a Mars origin of meteorites that were geologically young lavas, with signs of exposure to groundwater rich in oxygen and containing trapped noble gasses, apparently deposited by the same groundwater that was in contact with the Mars atmosphere. That this assumed a Terrestrial hydro-cycle, precipitation from the atmosphere and percolation into the ground to become groundwater, was an assumption left unspoken. The Mars meteorites could only be identified as Martian if a Terrestrial model of Mars' recent past was entertained. Bare rock would not do it. However, despite grudging acceptance of the Martian origin of the Mars meteorites, the Lunar Mars Model still reigned supreme, with minor allowances for an early warm-wet period several billions of years ago.

In particular, the lunar chronologies were still applied, despite the fact that the Mars meteorites were all much younger than any area of Mars under the lunar chronologies.

While Mars science was undergoing a revolution due to a new interpretation of the Viking data, the Cydonia investigation had progressed also. A Bronze Age archeological site model was derived by the author from Cydonia Mesa: that any civilization of Mars would have to be sited slightly above the northern ocean sea level, on local high ground, and near water channels. Using this site model, another place was located at the edge of Utopia Planum, near an old water channel called Hradd Vallis, at slightly above the Mars sea level line on a line of mesas called Galaxias Chaos. Ordering images of the region, sight unseen, the author discovered numerous strange landforms resembling a ruined city, and two face-like objects, one of which resembled the face in Cydonia in detail. The two faces, now termed Galaxias and Chaos, seemed to share several anatomical and ornamental details with the face of Cydonia. This, and other strange landforms found in an arc from Cydonia to Elysium, along the northern ocean shoreline, together with the mass of other Viking data, formed the basis for the Cydonian Hypothesis.

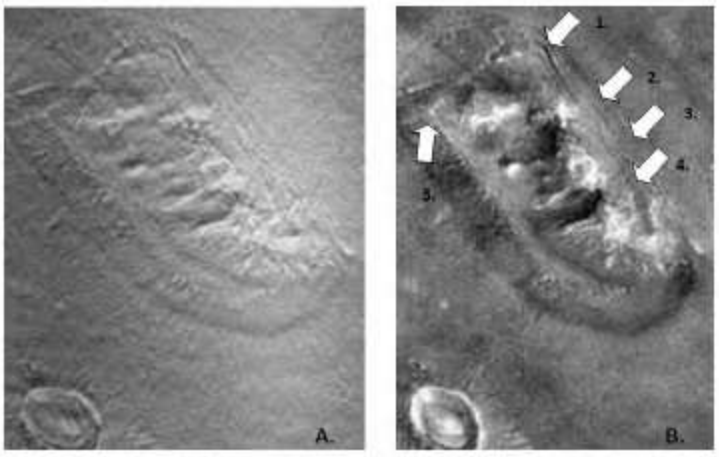
The Cydonian Hypothesis was the simplest hypothesis that could be formed to explain the face of Cydonia, the D&M Pyramid, and the faces in Galaxias as the results of a humanoid indigenous civilization. The Cydonian Hypothesis postulated no new processes on Mars, only a new locale for processes already demonstrated on Earth: life and the evolution of humanoid intelligence and civilization. This required an interpretation of the mass of Mars Viking and meteorite geochemical data that came to be called the New Mars Synthesis.[2] The New Mars Synthesis could be summarized as four main points: 1. The cratering rate at Mars was at 4x Lunar resulting in much younger surfaces ages for the North of Mars. 2. Mars had a liquid water environment including Northern Ocean for most of its geologic history. 3. Mars had a massive and evolved biosphere and an oxygen rich atmosphere. Continuing the effort at guerilla science, it was pointed out that the young ages of the Mars meteorites indicated that the Mars surface had to be young. This concept was echoed by Treiman[5] and later more forcefully by Nyquist.[6] The Lunar chronology of Mars is dead and the Lunar Model with it.

However, as one Mars scientist who agrees with the 4x Lunar cratering rate reported to the author: ***"It doesn't matter what we have proven, no one pays any attention!!!"*** Mars' North is geologically young, based on the radiometric ages of the Meteorites from that region. The discovery of the Martian origin of the CI carbonaceous meteorites, research motivated by Cydonia, which are 2% tar-like organic matter and reportedly loaded with microfossils, was made several months before the ALH84001 'life-rock' announcement, and reported to, and apparently emboldened, NASA's leadership to trumpet the later ALH84001 results. This identification of the CI as Martian, which places large amounts of organic matter on early Mars, has recently been confirmed by the oxygen isotopes of the Mars meteorite NWA 7533. It was also discovered that the exposed Mars sediments 8 kilometers deep in the Valles Marineris were highly oxidized like the surface. The discovery of hematite in vast amounts on Mars' surface can only be explained as the watery exposure of Mars' soil to an oxygen rich environment. Thus, the trend of Mars science has been to support the New Mars Synthesis. But, in opposition to this, like a religious orthodoxy, the Lunar Mars Model (now allowing for some liquid water in the early Heavy Bombardment Period) persists zombie-like, partly, in the author's opinion, because it keeps Mars safe for robotics.

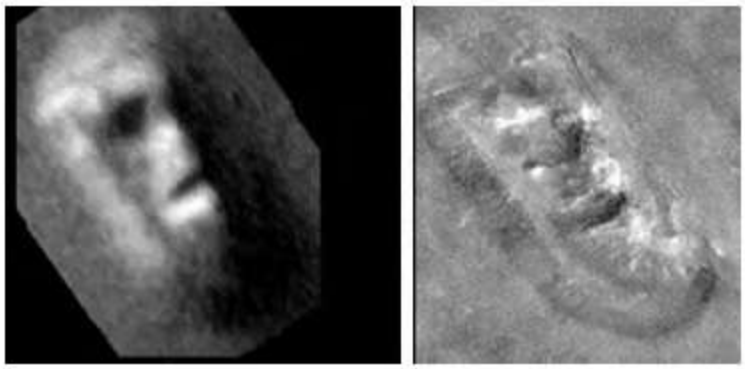
2004 Mars Odyssey image V10598012 of the face in Cydonia. Note circular crater beside the face.

In 1998, the Mars Surveyor orbited Mars and the Cydonian investigation

had been much strengthened and broadened with the organization of The Society for Planetary SETI by Dr. Horace Crater. The investigation was further strengthened by the brilliant image processing work of Dr. Mark Carlotto, who independently confirmed the work of DiPietro and Molenaar and found even more suggestive features. ***The McDaniel Report,*** by Dr. Stanley McDaniel, had exposed the blatant attempts by NASA, or the JPL led faction within it, to suppress and deny key pieces of data concerning Cydonia. Added to this was the urging of Carl Sagan, from his death bed, that the Cydonia Face should be reimaged. [1] In response, the leadership of NASA had agreed to take new images of the face in Cydonia and held a cordial meeting with key members of the SPSR at NASA headquarters. The Headquarters people insisted that the new images would be taken and released immediately without prejudice. However, as mentioned before, the members of SPSR were to discover that no one informed JPL and its contractor, MSSS, of this headquarters policy.



(A) Poorly enhanced MSSS released image (P220-03 NA image) released 5 April 1998 (B) Enhanced version by Carlotto. showing: 1. Helmet ornaments, 2. Eyes, 3. Nostrils, 4. Mouth 5. Frame-corner. Note elliptical of crater beside the face demonstrating oblique viewing angle.



Carlotto shape-from-shading derived images showing expected view of the Face from Viking data at MSSS image viewing angle versus enhanced MSSS image (Courtesy Mark Carlotto)

The manner of capture and release of the new image of the face in Cydonia by JPL demonstrated a naked desire to suppress its meaning and mislead the public, a pattern well-documented in the ***McDaniel Report.*** The new image of the face in Cydonia was taken at an oblique angle, not from nearly vertical as the two Viking images had been, as evidenced by the ellipsoidal shape of the nearby crater. The image, already confusing to the public because of its different geometry, was released in succession of unenhanced and distorted forms. The operation had all the markings of a carefully contrived "Psy-Op." However, when Dr. Carlotto enhanced the image, using standard image processing techniques, the enhanced image clearly showed the eyes, nose, and helmet seen before, but also revealed new details such as nostrils in the nose and ornaments on the forehead of the helmet that had been invisible or only hinted at in the Viking images. A three dimensional rotation of the image, based on a 3-dimensional model of the face developed from the two Viking images by Carlotto, showed the face as it would appear as seen from above, and this image was confirmed by the later images of the Face. Thus, rather than the impression cultivated by JPL, the new images have confirmed the face in Cydonia's resemblance to an Olmec head or the Sphinx. This is despite obvious erosion, which is the expected result of the objects creation in a period of Earthlike climate. When this was pointed out forcefully at a later scientific conference paper, a former JPL officer became so enraged he tried to attack Vince DiPietro physically in the author's presence. New images have also confirmed the eroded archeological appearance of the D&M

pyramid and the upper face at Galaxias.

Malin had “pulled a fast one” on the media, and had gotten away with it, at least for a while.[7] They had been ‘MSSS-led.’

The new images and new data from both Mars probes, landers and meteorites, are all consistent with the New Mars Synthesis; that Mars was Earthlike in every way for most of its geologic history. The new imaging data from Cydonia and Galaxias thus confirm the Cydonian hypothesis. Mars apparently lived like the Earth now lives, and like Earth, became the home of a humanoid civilization. While it cannot be proven that Cydonia, the sign of possible life in Mars’ past, did indeed save Mars science from oblivion after the failed Viking life experiments, it can also be argued that without the work of DiPietro and Molenaar, the IMIT, Stan McDaniel and the SPSR, the Mars Meteorites would be still be sitting in museums, labeled as merely “anomalous achondrites” and Mars would be of as little interest as barren Mercury. However, it is now Mars that is the focal point for human space endeavors. As for the author, it is a perverse delight to be “he-who-must-not-be-cited” on Mars.

Since the Viking took the image of the Face in Cydonia on Mars, we have obtained a new Heavens and a new Earth. The number of exo-solar planets is now in the thousands and the Cosmos is now known to be awash in the stuff of life: water and organics. Life on Earth is now known to have begun very early, almost as soon as an ocean formed on its surface. This indicates life is both a probable and natural occurrence on any planet whose surface conditions are similar to conditions now known to be shared by both early Mars and Earth. We now live on an Earth that, from its earliest period, was part of a living cosmos. Mars, as well, is now being confirmed as part of the living cosmos. The dark visage of Cydonia, whether acknowledged or not, has been the secret driver of this new knowledge.

When the “big day” arrived in Cydonia, Vince and I and several other RSI personnel were in New Hampshire making “ball lighting” for the US Air Force. We had rented time at a high powered microwave facility to scale up our small-scale success in household microwave ovens. Vince, having retired from NASA, was now working for RSI and doing a fabulous job as a mechanical and electrical engineer. We came back to the hotel, ironically

named for the “Old Man of the Mountain” natural face profile located nearby, after a long day of not being able to recreate the balls of plasma we had made on a smaller scale. We were both tired and hungry and were then confronted with the first released images from MSSSS out at JPL. The new images of the face had generated a media frenzy, but not the kind we had wanted. The images shown on Cable news programs were almost incomprehensible and obviously not what we were hoping for. Everyone in the press was saying the face was nothing but a ‘jumble of rocks.’ Vince and I looked sadly at the images we had waited for decades to see, and conceded defeat. Emails from other members of SPSR expressed shock and disappointment. Vince and I both shrugged and resolved to endure our disappointment like men. “Disappointed, and going out to get drunk,” I emailed Mark Carlotto. Fortunately, a restaurant and lounge was just a few staggering steps away across the parking lot at the hotel.

We had a nice dinner, concentrated on determined scientific counter attack the next day at the microwave facility, and had a few beers, then a few more. In my scientific career I was very accustomed to success, even if it got me in trouble. The new image from Cydonia was a big jolt to me.

“I don’t understand it, Vince! I thought we had this thing nailed! I am good at this shit, and I never make a prediction unless I am certain I know what will be seen.” I said, after a few beers.

“Well, when I started this thing, I thought NASA would give me a medal!” said Vince. We both had a good laugh.

Finally, the restaurant was closing,

“Well Vince, I got involved in this thing to end the Cold War, so our daughters could grow up free from the danger of a nuclear holocaust! At least we succeeded in doing that!” Vince and I had another good laugh at this last bombastic claim, emptied our last beers and staggered back to the hotel. I went to my room, where I found that my able colleague, John Kline, had managed to download the MSSS released image and ship it to me. I looked at it drunkenly for a while. It was a very poor image with no contrast, looking like a boot print in the snow, or, as others would say, “an object in a cat-litter box.” I could not recognize it compared to the Viking images, and wondered

if it was even the right object. But there was a crater beside it, like in the Viking images, so I shrugged. I worked for while on a list of things to try on the Ball Lighting experiment. Vince, being unable to sleep, came up to my room, where I was keeping a puzzled and sad vigil watching CNN. He seemed to have gotten even more beer from room service and so we were drinking it. I was sitting in this nice comfortable chair, wondering how my normally flawless scientific instincts could have been so wrong in this case, when a gray-bearded former chief scientist of JPL was introduced on CNN and was being interviewed.

“We told everyone this was nothing, now we have proved it!” he said angrily. Both Vince and I looked at each other in puzzlement. We had both grown up in tough towns, where reading people’s faces was an important skill.

“That’s funny, Vince. He doesn’t seem happy. In fact, he looks like he just saw a ghost.” I commented.

“Yeah, isn’t that strange. Why isn’t he happy?” muttered Vince, in amazement. I told Vince that we had a big day ahead of us tomorrow, and he should get some sleep. He then went back to his room, but I myself couldn’t sleep. Finally I got up and turned on the laptop again and pulled up the image. In the darkened room the new image of the Face in Cydonia image glowed softly, beckoning me.

The next day we were doing a countdown before turning on the microwaves from the huge generator. It would flood our portable experimental chamber with the power of close to a hundred household microwave generators. We had decided to abandon our very sophisticated ball lighting igniter, which had been perfected and scaled up from household microwave ovens. We were going to ignite the plasma with a “down and dirty” method that had worked in the early small experiments.

“5, 4, 3,…” we were all pulling down our welding goggles over our eyes.

“2, 1 Zero!” The powerful microwaves flooded the chamber. Boom! A blinding ball of blue-white fire erupted from the floor of the chamber and danced in the center. It was as big as a soccer ball. Success! We all gave war whoops and I gave a mad scientist laugh of triumph. Vince was watching the

readouts from the electric probes in the plasma.

Brandenburg doesn't like to lose… I thought. We had succeeded. We had also succeeded apparently in Cydonia, no matter what CNN had been led to believe.

"Vince! Malin has bull-shitted us! They took the image from an oblique angle and then released it unenhanced! "Vince had reacted in shock to this, earlier that morning. "It's eroded, but it is a face, it's even got ***nostrils*** in its fucking nose!"

I noted that the crater beside the face in the image was not circular, but an ellipse. I realized suddenly that the image had not been taken from directly above, like the Viking images, but from an oblique angle so it almost viewed the face in profile. The lighting geometry was from nearly below the face, also much different than the Viking images. My feeling of depression to being proved wrong was now replaced by puzzlement and curiosity.

I got a pen and a pad of paper and, realizing now the viewing and geometry, I began sketching the face and then carefully checking details with a Viking Image. As I worked my joy grew. The details, eyes, nose mouth, helmet were all there, so was erosion, obviously. On the helmet forehead were ornaments and in the nose, nostrils. I was stunned, and also quite pleased. They had tried to take image at an unfamiliar angle in unfamiliar lighting and in the process had illuminated new details.

The Malin Space Science people had obviously taken the image under as radically different viewing and lighting geometry from the original Viking images as possible. They had then released the image without any contrast enhancement. It was obvious now why the scientist on CNN was so upset looking. The scientist was deeply involved in misrepresentation of scientific results to the public, and he had also seen something that frightened him, an eroded, but obviously carved face on Mars.

A month later at the spring meeting of the AGU, May 28, I was away from our own poster looking at an interesting poster by a student, when I looked up and saw the same scientist who had looked so distraught on CNN. He was staring at Vince DiPietro's and my poster and shaking with rage. The poster showed a fully enhanced image of the face as well as a rotated version, using

Carlotto's 3-D shape from the shading model with the new image applied to it and then rotated so as to appear as seen from above, like the Viking images.[8] In both images the helmet ornaments, eyes, mouth, helmet and nose with nostrils were clearly seen. We had won by a nose. I had christened the face "Cydone."

"You're saying its artificial!"

"No, we say it appears artificial." I replied.

Vince who had also been distracted, approaches and asks the scientist why the "grayscale" on the released image was so narrow. This leads to a decrease in resolution since adjacent pixels would assume the same gray value, looking like one giant pixel. We had termed this phenomena "rafting" because the pixels would cling together in rafts.

"You don't know what you're talking about!" the scientist suddenly yelled. Everyone around the poster area turned, startled.

"Yes I do," said Vince. He most certainly did.

"ARE YOU CALLING ME A LIAR??? I'LL DECK YOU, BY GOD!" screamed the scientist, raising his fist and lunging at Vince. I stepped into his way, and he bumped into me.

"Calm yourself Sir!" I urged, and he settled down, finally walking away.

Once the bizarre incident was over, we all tried to make sense out of it. Like the shoving incident at the NASA reception with Sagan in attendance, this indicated an almost hysterical reaction to the face in Cydonia and attempts to investigate it. Finally, it was crystal clear to me, they were seeing the same face we were, and we were seeing the reaction of men who are locked in an internal struggle between what they saw and the scientific position they were now defending. It meant we were winning our long struggle. It wasn't going to be won in an alley, but on the plains of Mars.

"This means this Mars thing isn't over, Vince. It means this thing is barely started" I said, as the scientist walked away.

We returned to NASA HQ and urged them to take more images. Dan Goldin, who had been shown the new enhanced and rotated images, agreed

and insisted that the face would be reimaged until “the matter was settled.” Soon, more images arrived.

The Sphinx before partial restoration. All Earthly archaeologies show some signs of erosion

We are guided in our consideration of new imaging data from Mars by the Assumption of Mediocrity. That is: our assumption that archeological relics found on Earth are not remarkable. That is, if Mars was like Earth in climate for a geologically long period, as it seems to have been, we would expect Sphinxes and Pyramids, similar to those found in Egypt and Mexico.

A close Earthly analog to the Cydonia face is provided by the Olmec heads in Mexico. Not only do they display faces enclosed by helmets, but also display ornamentation on their helmets.

Olmec head with helmet ornamentation and erosion

Helmet ornamentation found by Carlotto in Viking images 35A72 (left) and 70A13(right) (images by Carlotto)

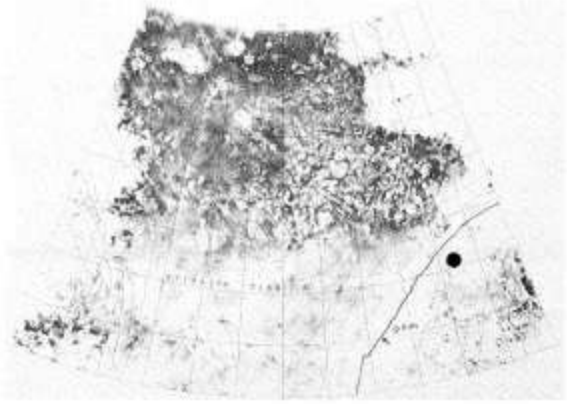
Detail of figure with contrast change, note "frame-corner" of face and contrasting helmet ornaments.

In both the Sphinx and Olmec heads, a common feature is noted and is caused by the region of contact of the geometry defined by the face and the geometry of the helmet or headgear. We will term this a "frame-corner"

where the line defined by the vertical side of the face or the horizontal line defined by the eyes meets the lines defined by the helmet or headgear. This frame-corner makes the transition between the geometry defined by the face region and the geometry defined by the headgear and, on the Sphinx, is a sharp angular structure of approximately 30 degrees, and on the Olmec heads is 90 degrees.

In the original article, possible artifacts at Duetronilus Mensa and Elysium were considered along with those at Cydonia Mensa and Galaxias Chaos (Utopia). However, new images indicate, that while still geologically anomalous, these objects appear too highly eroded to be considered for the present investigation; therefore, we have chosen to concentrate on the possible artifacts at the two latter sites.

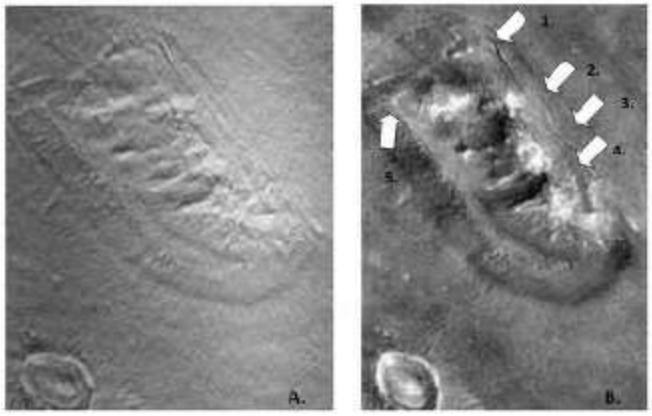
Detail of Sphinx with contrast change, note "frame-corner" of face and contrasting headdress ornaments.



Map of Cydonia Mensa region showing location of Face and D&M Pyramid

Many new images of the face in Cydonia and the D&M pyramid have been obtained. The new images of the Face from Odyssey confirm its overall structure as a shallow ellipsoidal dome- shaped object of 3x2 kilometers length and width and an approximate maximum height of 300 meters, determined by shape from shading and shadow analysis. Previous detailed analysis of the images on Viking frames 35A72, 70A13, taken in the afternoon as well as 753A53 and 753A54 taken in the morning, confirmed its overall right left symmetry, and 35A72 and 70A13 showed what appeared to be eyes, nose, mouth, and apparent helmet ornaments.

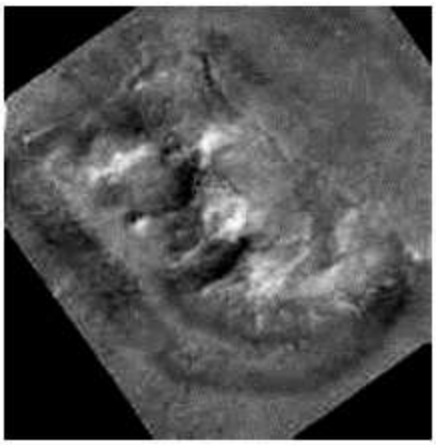
The first new image, though taken from an oblique angle rather than from overhead, and once enhanced, yielded immediate confirmation of overall anatomical completeness of the face, and despite obvious erosion, helmet ornaments and startlingly, a pair of nostrils not visible in the Viking images.



(A) Poorly enhanced MSSS released image (P220-03 NA image) released 5 April 1998 (B) Enhanced version by Carlotto. showing: 1. Helmet ornaments, 2. Eyes, 3. Nostrils, 4. Mouth 5. Frame-corner. Note elliptical of crater beside the face demonstrating oblique viewing angle

Using his three dimensional shape from shape-from-shading model, Mark Carlotto[7] was able to rotate the oblique image to give an approximate view of the object in the illumination it experienced, if viewed from above, as on the Viking images. The presence of helmet ornaments, as well as teeth in the mouth, had been predicted by Carlotto in the ***The Case for The Face***[9] The ornaments were now confirmed, nostrils in the nose were visible, as well as

the overall symmetry of the Face was confirmed. However, teeth, predicted by Carlotto based on Viking images, were absent. A new image confirmed the helmet ornamentation and found it apparently consisting of surfacing of various parts of the helmet area with different types of stone.



The face image rotated using a 3-d model of the Face (Courtesy Mark Carlotto)

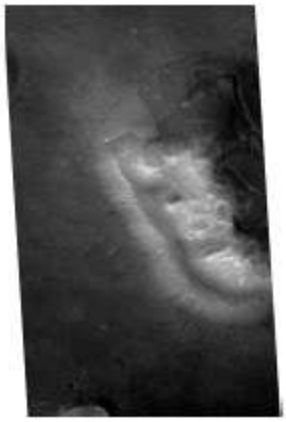
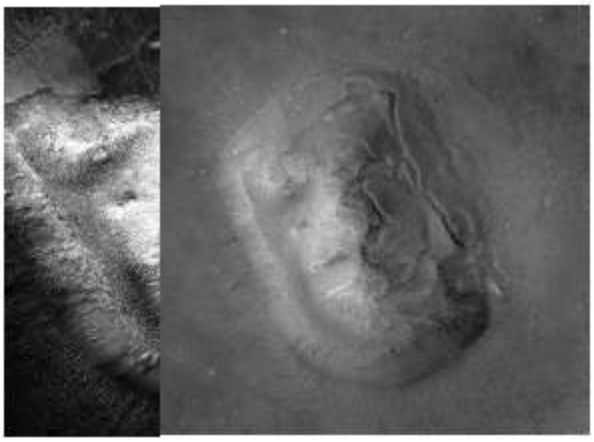


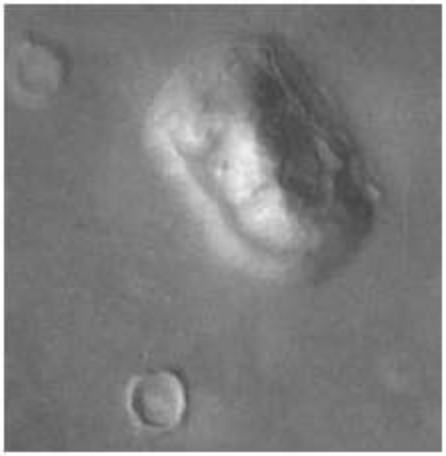
Image E10-03730 confirming nostrils, helmet ornaments, and frame-corner



MOC image M16-00184 (left) and MOC image E03-00824 (right) showing nostrils and helmet ornamentation

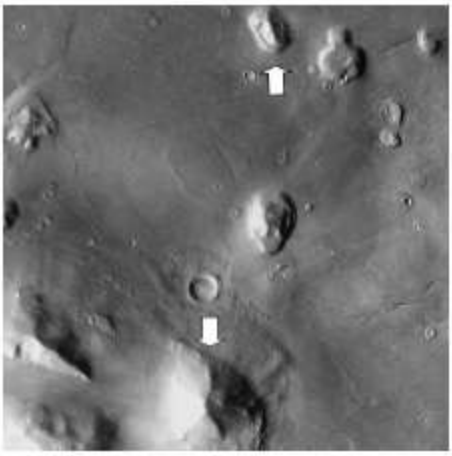
Full frame images of the Face were obtained under various illumination conditions, confirming both overall symmetry, anatomical completeness and the presence of nostrils and helmet ornaments. Finally, in 2004 the Mars Odyssey spacecraft, not controlled by JPL, arrived at Mars and proceeded to confirm all of DiPietro and Molenaar's work by taking several images of the face at Viking-like illumination and viewing angle.

2004 Mars Odyssey image V10598012 of the face in Cydonia



2005 Mars Odyssey image V1024003 of the face in Cydonia

2006 Mars Odyssey image V12445004 of the face in Cydonia

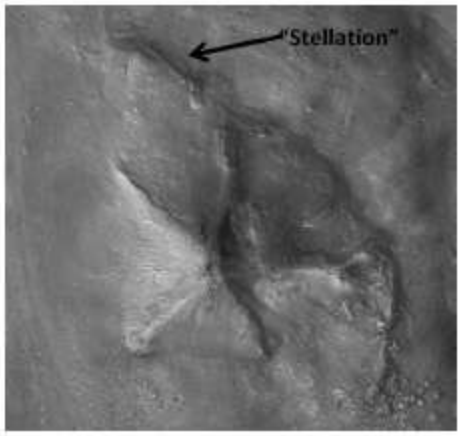


Mars Odyssey Themis Image from public release 042Cydonia of the Face on Mars and D&M Pyramid.

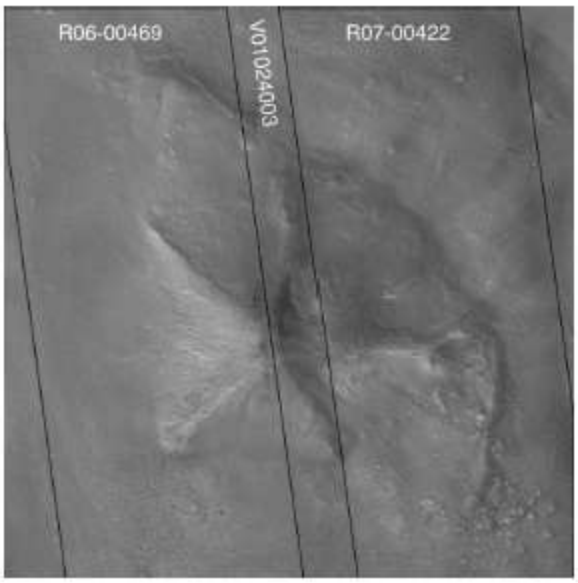
On Earth some pentagon shaped structures have associated “stellations” or

extensions of their geometry, this is seen also on the D&M pyramid.

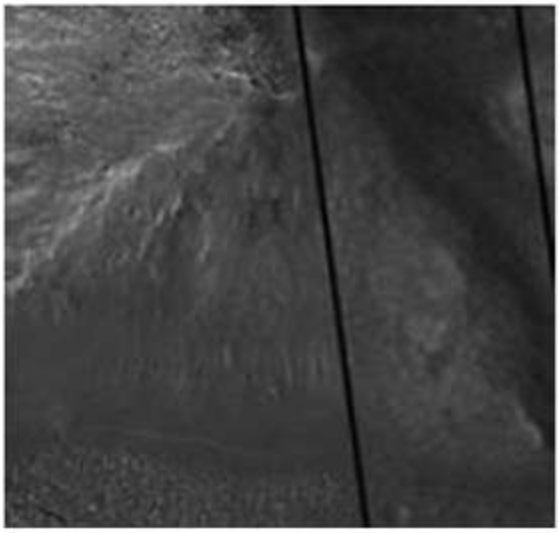
Pentagon-shaped Fort McHenry at Baltimore showing stellation



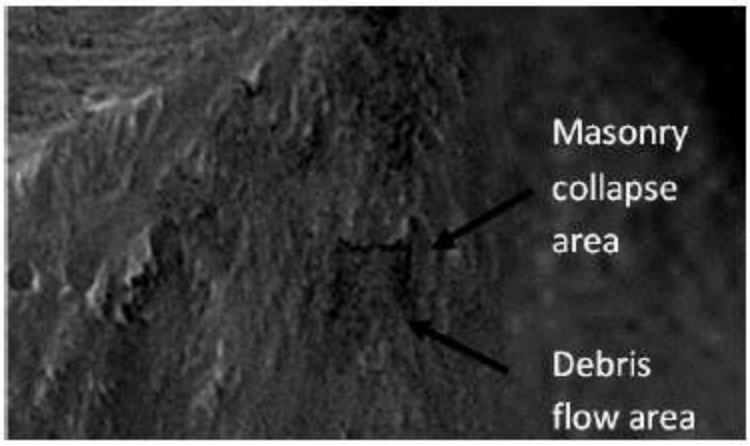
D&M Pyramid at Cydonia Mensa showing apparent stellation



High resolution composite image of the D&M Pyramid with MSSS frame numbers



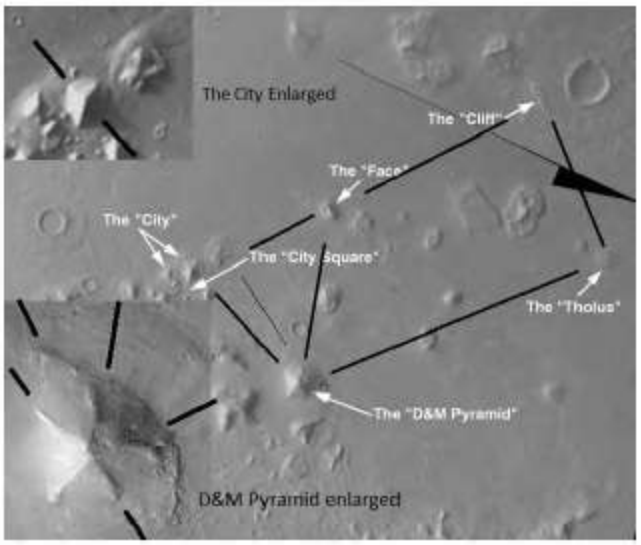
Enlargement of the D&M pyramid images showing dark square collapse zone in center of image



Enlargement of high resolution image portion of the D&M Pyramid showing apparent collapsed brickwork and landslide area

Alignments among the objects of interest in Cydonia were found by its first investigators using Viking data and are similar to alignments found in Earthly sites such as the Giza pyramid site and even the Washington DC Capitol Mall. These alignments indicate that the objects' proximity to each other is not coincidental but part of an overall intelligent arrangement. Therefore, based on the confirmation of the face and D&M Pyramid details and structure seen in the Viking images, plus new anatomical and structural details seen in the images, the confirmation of the alignments of the objects seen in the Viking images, the author has concluded that objects do represent a dead civilization.

Based on the widespread evidence for a geologically long period of Earthlike condition on Mars and evidence for life on Mars, the author concludes that the civilization was indigenous to Mars and perished during some catastrophe that collapsed Mars' climate system. Evidence that this catastrophe may have been a nuclear holocaust is also present, suggesting that the Mars civilization reached high levels of technology, though it's overall appearance is of a primitive Bronze Age civilization. This latter conflict between evidence for nuclear weapon technology and yet primitive civilization of the other, means that hostile technological agencies extrinsic to Mars may be implicated in the Red Planet's demise.

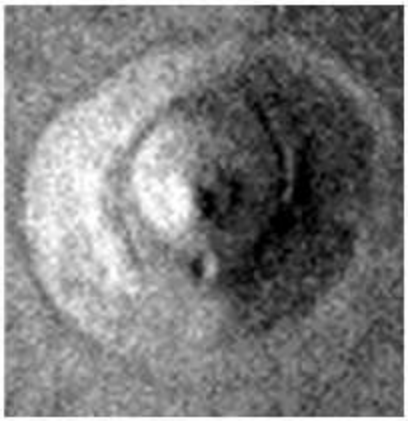


Face on Mars and the D&M pyramid and other objects and their apparent alignments, first proposed by Richard Hoagland and Erol Torun

Aside from the Face and D&M Pyramid, the most remarkable objects in Cydonia would have to be the “wall” and the “Tholus”. The Wall sits on top of the ejecta apron of a large crater. It has to have been emplaced after the crater formed because the ejecta does not “splash” around it but appears to go continuously under it. The Wall is thus geologically inexplicable and thus formed by non-geologic forces. Given its context and alignment, it appears to have been constructed to form a backdrop to the Face. This object was first discovered by Richard Hoagland.

The "Wall" in Cydonia Mensa, note that the ejecta apron of the crater appears continuous under the wall.

The Tholus is also geologically different from everything in the vicinity, looking like a volcanic formation, while everything around it appears to be the product of erosion.



The Tholus from 70A13

Tholus Image M0300766

Thus, the alignments first noted by Hoagland and Erol Torun, and the new facial detail first noted by Mark Carlotto were all there. Collapsed brickwork was also seen on the D&M pyramid.

The face, despite the expected erosion, had revealed new details. It had helmet ornaments. The nose on the face had nostrils. As scientists, we had taken the ultimate gamble of our careers, and we had won by a nose.

Later, new images of both the face in Cydonia, the D&M pyramid and the objects in Galaxias Chaos were taken. They all confirm the Cydonian Hypothesis. Mars is apparently the home of a dead civilization.

So, with the acquisition of new images of Cydonia which confirmed the features seen in the Viking images and went beyond them, and the screaming and struggles that accompanied it, Pandora’s Box was opened on Mars. The human race had unwittingly passed into a new age. Nothing, not the Earth, or the stars, would ever be the same again. A new chaotic element had entered galactic affairs, humanity.

It also became apparent, that only was there evidence of past intelligence on Mars, but also massive evil.

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Chapter 6 The Dark Star Scenario

I had become interested in Mars meteorites and had published two papers on them.[1,2] In this investigation, I had become very familiar with nuclear isotopes, which are very important for tracing the origin of meteorites. In particular, oxygen and xenon isotopes are very important in identifying whether meteorites are from Mars.[3,4] I had then become more interested in the Mars xenon 129 abundance and its meaning. I had thought that xenon 129 superabundance had been found on Venus, but I was mistaken. The measurement had not been made. The xenon 129/132 relative abundances on Earth, the Sun and Jupiter were all nearly equal.[5] Given the data from across the Solar system, Mars was clearly anomalous. This discrepancy led to a detective story worthy of Sherlock Holmes, with an outcome just as grim.

Xenon 129 is the decay product of Iodine 129, whose half-life is 15.7 Million years, by far the longest lived of the iodine isotopes. Thus, it is not surprising that occasional minerals separated from meteorites, especially magnetite grains, may have been sites where iodine was concentrated chemically, possibly even by biology, and thus show a large amount of xenon 129. Well gases found in New Mexico, near rich uranium deposits, have also shown an abundance on xenon 129, along with a another product of radioactive decay, argon 40, indicating possible past natural nuclear reactors operating in the aquifer. However, this glaring xenon 129 excess at Mars is in the atmosphere of a large planet.

A signature feature of Mars atmosphere is the predominance ^{129}Xe and ^{40}Ar over its other isotopes [5]. This allowed the identification of Mars as the parent body of the SNC meteorites. However, it meant something else, something that caused the physicist at Sandia to react with horror. Now, after discovering that this isotopic feature was peculiar to Mars, I had to know why the physicist had reacted this way. Upon investigation, I discovered that the xenon 129 superabundance was found on another planet, my own. It was found in a component of the atmosphere that had appeared since the 1950's.[6] So my investigation of the dark secrets of Mars led me to delve into the dark

secrets of Earth.

At first, I thought the xenon 129 was due to the operation of nuclear reactors. But later, as I tried to quantify this, I discovered that nuclear reactors produced very little xenon 129, and the iodine 129 that they produced decayed too slowly, with a 15.7 million year half-life, to account for the appearance of the xenon 129 component in the Earth's atmosphere since the 1950's.

No, the appearance of the xenon 129 component was due, not to the operation of nuclear reactors, but due to the violent fission of uranium by fusion neutrons in hydrogen bomb explosions.

Table of Xenon isotopes in the Martian atmosphere.

Xenon Isotope Abundance Normalized to ^{130}Xenon Abundance									
Inventory	^{124}Xe	^{126}Xe	^{128}Xe	^{130}Xe	^{132}Xe	^{134}Xe	^{136}Xe	^{129}Xe	^{131}Xe
Earth	2.337	2.180	47.146	649.58	=100	521.27	660.68	256.28	217.63
Earth w/o NT	2.337	2.180	47.146	605.3	=100	518.73	651.8	247.0	207.5
Earth Δ	0.00	0.00	0.00	44.28	0	2.54	8.88	9.28	10.13
Mars	2.45	2.12	47.67	1640.0	=100	514.7	646.0	258.7	220.4

Earth without NT (Nuclear Testing) component is shown on line 2. Note marked difference in abundances of xenon 129

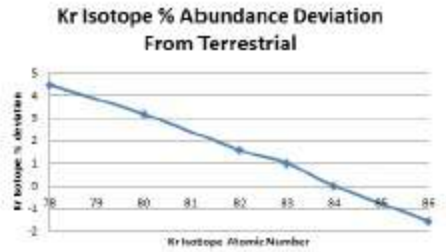
Xenon 129 is approximately 1/5 of the abundance of krypton 84 in the Mars atmosphere, and the krypton isotopic system is disturbed, relative to the Earth's, at about the order of 1/6 and is "reverse fractionated." Earth, despite the catastrophes that have occurred in its history, is believed to have retained is atmosphere mostly intact since its formation, and thus its isotopic distribution is considered a standard for primordial isotopes for large rocky planets like Mars. Various processes can erode a planet's atmosphere over time, especially if it has no strong magnetic field like Mars. These processes tend to erode the top of the planet's atmosphere, and thus erode lighter isotopes more that heavier ones. The result is that such processes of atmospheric erosion tend to fractionate, or disturb, the distribution of isotopes in a way that makes heavier isotopes relatively more abundant than lighter ones. However, on Mars, whatever process disturbed the krypton isotopes made lighter isotopes relatively more abundant that heavier ones. That is,

rather than being disturbed relative to Earth krypton in a way that favored heavy isotopes, a signature of atmospheric losses at the top of the atmosphere by UV or Solar wind processes, which swept away lighter isotopes but left heavier ones behind, the krypton isotopic system favored lighter isotopes. The only distribution of krypton isotopes that resembles that of Mars are those of the Sun itself, a nuclear furnace. Thus, the krypton isotopic distribution of Mars is found to have a disturbance of the same order of percentage as the xenon 129 measured relative to krypton 84 and appears to reflect a nuclear process on Mars rather than a mass fractionation in its upper atmosphere. Mars xenon to krypton abundance ratio is also much larger than on Earth: Mars relative abundance of xenon to krypton high relative to Earth. On Mars Kr/Xe abundance ratio is approximate 4 to 1 whereas, on Earth, the ratio Kr/Xe of abundance is 10 to 1. Further, both xenon and krypton are superabundant relative to Ar 36, a primordial isotope when compared to an Earth standard. On Earth, there are approximately 54 Ar36 atoms for every Kr 84 atom, while on Mars the number of Kr 84 is nearly doubled so the relative number drops to 28. On Earth, there are approximately 1300 Ar36 atoms for every Xe 132, but on Mars the amount of Xe 132 is also nearly doubled so the ratio is 576 to 1. Both krypton and xenon are a products of nuclear fission whereas Ar36 is considered primordial to the Solar System. Thus, the krypton and xenon excess relative to argon-36 is consistent with a large fission event on Mars that added large amounts of Kr and Xe to the atmosphere. Therefore, based on disturbances and super-abundances in both krypton and xenon, it appears a large fission event took place on Mars.

Table of Krypton isotopes in the Martian atmosphere

Comparison of Mars and Earth Krypton Isotope Relative Abundances						
Isotope	^{78}Kr	^{80}Kr	^{82}Kr	^{83}Kr	^{84}Kr	^{86}Kr
Mars	0.637±0.036	4.09*	20.54±0.20	20.34±0.18	=100	30.06±0.27
Earth	0.6087±0.0030	3.960±0.002	20.217±0.021	20.136±0.021	=100	30.514±0.025
Δ (Earth %)	4.65%	3.28%	1.15%	1.01%	0%	-1.52%
Δ (^{129}Xe %)	20.6%	14.58%	5.11%	4.44%	0%	-6.7%

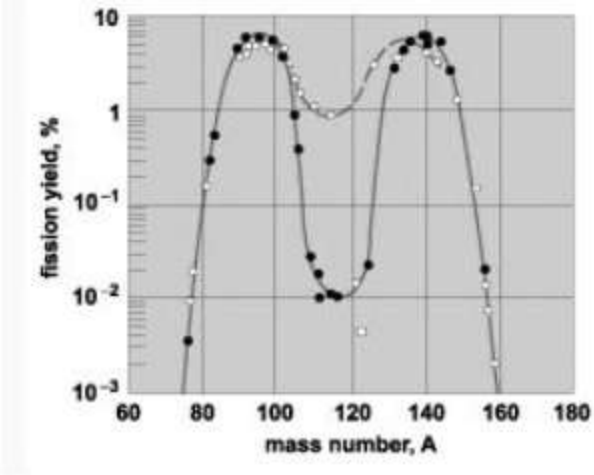
Note percent difference in abundances relative to xenon 129 in final line



The percentage of of deviation of abundances of krypton isotopes relative to an Earth atmosphere showing "reverse fractionation"

But what sort of fission process would have created this disturbance of both the xenon the krypton isotopes?

Fission processes from chain reactions produce a double peaked distribution of isotopes, with strontium 90 and cesium 137 being typical paired products. These fission products are the result of fissions induced by the slow neutrons produced by fission itself. However, as the neutron energy is increased the fission product distribution changes.[7],[8] As neutron energy increases the valley between the two peaks of abundance fills in, and finally, for fusion produced by 14MeV fusion neutrons, the peaks merge.

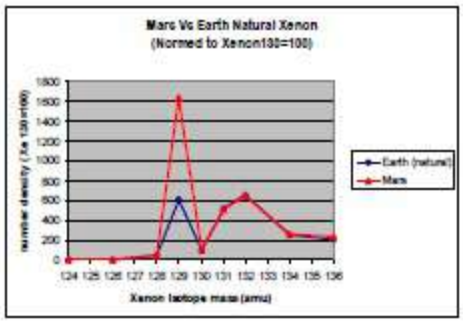


Mass distribution of fission fragments formed by neutron induced fission of 235U when neutrons have thermal energy (black dots curve) and fission by 14 MeV fusion neutrons (white dots curve) Data taken from references 7 and 8

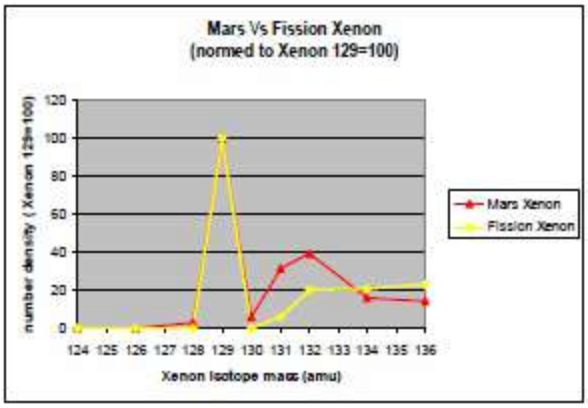
This shift in the fission product spectrum with increased neutron energy produces far more isotopes in the atomic mass 129 region in a hydrogen bomb than thermal fission with the result of much more xenon 129 than other isotopes of xenon. The xenon 'fingerprint' was thus of violent high energy fission, not any kind of reactor.

For 14MeV neutrons the amount of xenon 129 and krypton 84 are roughly comparable. Therefore, we would expect for 14MeV neutrons creating fission in uranium 238 or thorium 229 that the amount of krypton isotopes and xenon 129 to be similar. Therefore, the hyper-abundance of the xenon 129 at approximately 20% of krypton 84 and the disturbance the entire krypton isotope system at similar percentages are both consistent with a large mass of uranium 238 and thorium undergoing fission by 14MeV neutrons, the only energy of neutrons that can induce fission in these two relatively stable isotopes. Accordingly, it can be said that the xenon 129 hyper-abundance, at 20% of krypton 84, and the reverse fractionated krypton at the same order of relative percentage, tell us the same thing: that the large fission event that occurred on Mars featured fission driven not by low energy fission neutrons, but by high energy fusion neutrons. It, therefore, appears the large fission event on Mars was driven using fusion neutrons, this is why it produced the xenon 129 excess like that produced by nuclear weapons on Earth.

Therefore, the signature ^{129}Xe predominance of Mars can be explained as due to both fast neutron fission of ^{238}U and also ^{232}Th, which shares this same property of undergoing fast neutron fission. The krypton abundance and distribution is also consistent with fast fission of Th and U238. The hyper-abundance of ^{40}Ar is consistent with neutron irradiation of K^{39} over large areas of Mars surface, with transmutation to K^{40} and subsequent decay.



Mars and Earth Xenon stable isotope concentration normed to ^{130}Xe. (see color plates)


Mars Vs Fission Xenon
(normed to Xenon 129=100)
number density (Xenon 129=100)
Mars Xenon
Fission Xenon
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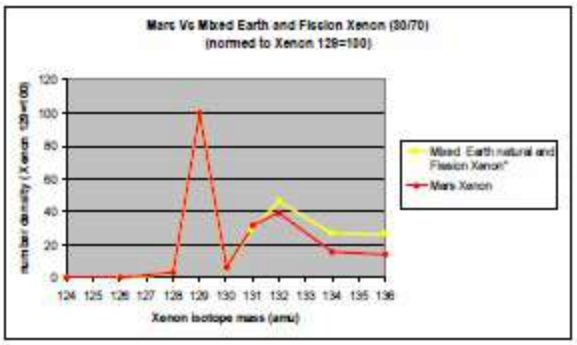
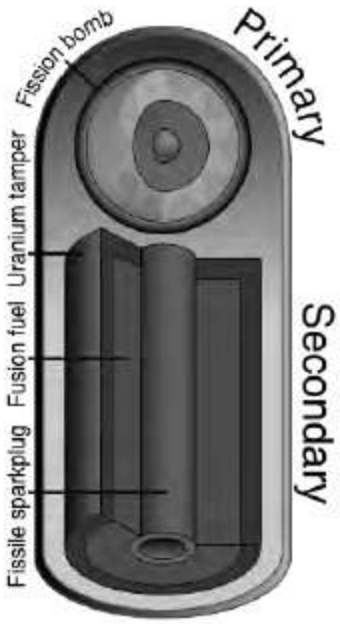
Xenon isotope mass (amu)

Mars Xenon and Earth Nuclear testing Xenon normed to ^{129}Xe concentration, data taken from reference 3 . (see color plates)



Mars and Earth xenon formed from 70 % nuclear testing xenon mixed with Earth natural xenon and normed to ^{129}Xe =100. (see color plates)

The superabundance of xenon 129 on Mars was mirrored in the superabundance of xenon 129 in the gases released by nuclear explosions on Earth. Xenon 129 is normally produced by decay of iodine 129, which as a 12 million year half-life. Accordingly, it is found in some meteorite minerals where some process, perhaps even biology, had concentrated iodine. However, this was not a magnetite crystal in a meteorite; this was the atmospheres of two planets. The xenon 129 was apparently produced directly in hydrogen bomb tests on Earth, because, in advanced hydrogen bomb designs, the hydrogen bomb core is wrapped in uranium or thorium to "boost" the explosive power by the fission of the uranium-thorium jacket under bombardment by high energy neutrons from the hydrogen fusion reactions. This violent shattering of the uranium and thorium nuclei by the high energy fusion neutron apparently created large amounts of xenon 129. I was familiar with these details of nuclear weapon design from my graduate school years at Livermore.



Basic Design of Hydrogen Bomb. Fission of a uranium tamper and casing doubles the explosive yield of the device and produces xenon 129 in large amounts (wiki commons)

Bottom line: the unique xenon 129 superabundance in Mars atmosphere, is not consistent with any known natural process, but rather matches the xenon 129 superabundance in the component of Earth's atmosphere due hydrogen bomb testing. The Mars krypton data is also consistent with this interpretation.

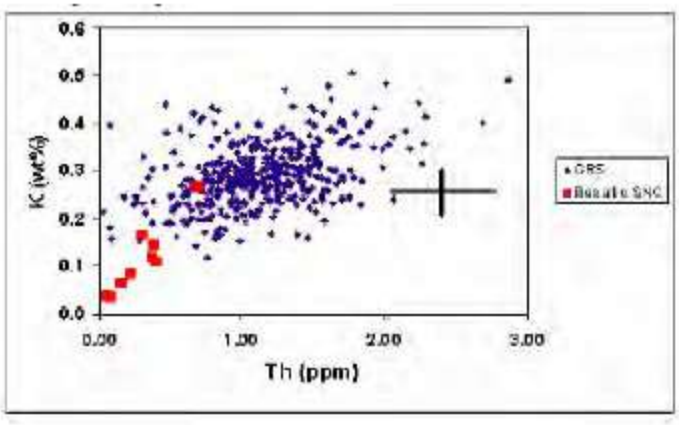
More data was found. Several of the Mars meteorites were found to have a super abundance of krypton 80, a decay product of neutron capture on bromine 79.[5] This could only be explained by the rock being heavily irradiated by neutrons before being launched into space from Mars. It was also found that Mars' surface had much more uranium, thorium, and radioactive potassium than the Mars meteorites. The Mars meteorites had originally been subsurface rock, protected from cosmic rays, on Mars before being launched into space. This means that Mars was covered by a thin surface layer of radioactive potassium, uranium, and thorium. The Mars atmosphere was full of argon 40; the decay product of potassium 39 after it had been irradiated by neutrons, and which is also produced by neutron capture on ^{40}K and thus the product of very intense neutron bombardment of

ordinary K. In an intense neutron flux, ^{39}K captures a neutron to become 40K and then captures another neutron to become ^{40}Ar. Such very intense neutron irradiation would also produce large amounts of 15N on the 14N in the Martian atmosphere. All of this meant that Mars had been the site of massive and violent nuclear explosions releasing intense local showers of neutron and scattering radioactive debris over the entire planet's surface. This was confirmed by the radiation maps of Mars' surface, showing two centers of radioactivity, one near Cydonia and one near the Utopia site now called Galaxias Chaos.

The ^{80}Kr abundance in Mars' Shergotites are consistent with exposure to a neutron flux of $10^{14}/cm^2$-$10^{15}/cm^2$, with capture on ^{80}Br depending on the neutron energy spectrum[5]. In the Shergotite EETA 79001, a composite of three distinct lithologies of approximately the same age, some lithologies show direct evidence of such irradiation. The difference in irradiation in lithologies of approximately the same age in the same meteorite suggests that this irradiation was a concentrated event in geologic time. The radiometric age of the lithology bearing evidence of irradiation is approximately 180 Myr. Other isotopic anomalies are present on Mars.

The Mars abundance of ^{40}Ar relative to Ar^{36}, $^{40}Ar/^{36}Ar$ is 7 times that of Earth: $^{40}Ar/^{36}Ar$[2] This is paradoxical because ^{40}Ar is due to the decay of ^{40}K, a neutron capture product of ^{39}K and yet Earth has much more K in its soil than Mars. The abundance D (^2H) in Mars atmosphere is normally considered to be the result of photolysis of water with mass fractionation in the upper Mars atmosphere but is also consistent with an episode of intense neutron radiation of the surface of Mars.

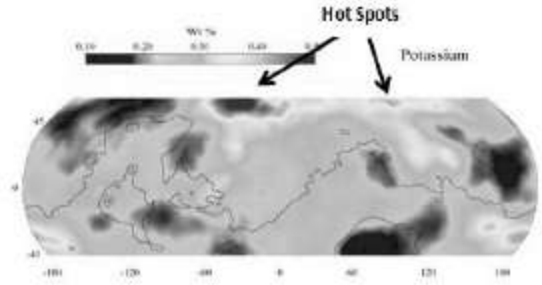
Meteoritic samples of Mars rock are mostly depleted in uranium and thorium relative to Earth. Support for this is found in the Phobos and Mars probe data. [9] This is now supported by the Odyssey GRS (Gamma Ray Spectrometer), which shows enhanced levels of Uranium and Thorium, in approximately chronditic ratio to each other in the top meters of the Mars surface that can be accessed from orbit.[10] It, therefore, seems possible that a large concentrated uranium and thorium body existed on Mars and exploded, giving rise to a global layer of debris enriched in uranium and thorium.



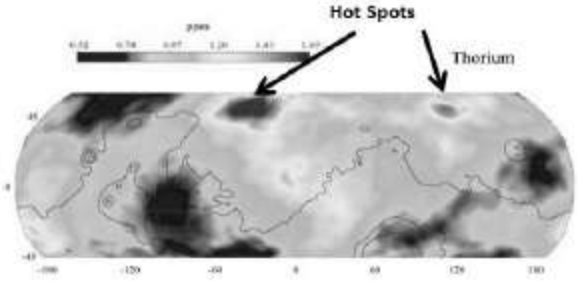
K and Thorium variations on Mars compared to Mars meteorites. Typical uncertainty is shown on the right. Figure taken from reference 10 (see color plates)

Potassium becomes radioactive when bombarded by neutrons and then remains radioactive billions of years, having a half-life of 1.26 Billion years. Potassium thus has a 'long memory' of radiological events. Likewise thorium decays very slowly, with a half-life of 14 Billion years. Thus, any concentration of thorium, once deposited, will remain visible as a source of radiation for billions of years.

The observed region of concentrated Th is located in Northwest Mare Acidalia centered at approximately 30W and 50 N and is a darker ring shaped area inside a major dark albedo feature on Mars. The appearance of a region of enhanced Th and radioactive ^{40}K is not reflected in maps of shorter lived Fe and Si isotopes and indicates the event occurred several million years ago and probably dates to the middle or late Amazonian epochs. Irradiation of lithogies in ETA79001 indicates a possible 200 million year age for the event.[5] Such an approximate age is chillingly similar to the time frame of the Great Permian extinction on Earth, whose extent was nearly total, whose cause is unknown, and whose survivors, such as cockroaches, display a marked immunity to radiation. Therefore, we live in a dangerous universe and we should not ignore possible warning signs of these dangers simply because we don't like to think about them.



Map of Mars global concentrations of radioactive ^{40}K from reference 8 (see color plates)



Map of Mars global concentrations of ^{232}Th from reference 8 (see color plates)

The presence of thorium in the apparent center of the explosion is particularly telling. Thorium is more abundant than uranium, but like u 238 only fissions appreciably in the presence of 14 MeV neutrons. If someone wanted build a planet -destroying hydrogen bomb, boosting its yield with a naturally occurring mixture of uranium and thorium would be a convenient choice. One retired nuclear weapons expert I consulted on this question referred to the thorium-uranium 238 mixture as “nuclear ANFO” by analogy with the cheap mixture of Ammonium Nitrate and Fuel Oil used in large scale blasting.

Confronted with a horrific scenario on Mars, I called our old friend Larry from the DIA and in the conference room at RSI, briefed him on what I had found. He was very sober and took extensive notes. It was not a happy discovery. I gave him a copy of my report. If he had known of this before-hand, he gave not the slightest indication of it. He thanked me and left to go report this to whatever place in the Defense Intelligence Agency such things

are reported. Somewhat depressed by my findings, I set the matter aside and concentrated on other work. Now I knew why the scientist at Sandia had reacted the way he had. It was the nuclear physics of intense and violent nuclear fusion explosions that created these effects. A slow burn in a nuclear reactor does not produce this pattern of xenon isotopes. Several months later, through another acquaintance who was part of the intelligence community, a message came back. Typical of the intelligence community, the message was phrased as a question: “Why don’t you publish?” Whatever authorities in the defense department who had jurisdiction of such matters, they had decided this was not classified. This gruesome finding should come out.

I resolved to get the phenomenon of the large nuclear energy release on Mars into the scientific literature by published the findings at the Lunar and Planetary Science meeting in Houston Texas and elsewhere.[11,12,13] I proposed for the meeting that the nuclear explosions had been due to natural nuclear reactors, similar to which had occurred on Earth. I proposed the ones on Mars had been much larger and finally had gone unstable and exploded. I was pleased with this concept because it simply invoked the idea of nature run amok. I almost came to believe in the Natural Nuclear Reactor scenario myself, the alternative being so awful to contemplate. However, there were two glaring flaws in the Natural Nuclear Reactor hypothesis that became apparent after I presented the papers and got feedback from other scientists. One problem was that the xenon spectrum was obviously from a violent fusion-fission bomb explosion, involving 14 MeV neutrons, not an exploding reactor. The other glaring problem was that natural nuclear reactors, being underground, would have left enormous craters when they exploded. No craters were apparently visible at the centers of the radiation patterns. The explosions were apparently “airbursts.” Based on these two features, the xenon spectrum and the absence of craters, I reluctantly concluded that the explosions were, definitely due to technologically created weapons. The location of the explosions correlates with the sites of the archeology found on Mars, Cydonia, and Galaxias.[14] This suggests that prevailing south-east winds were used to direct fallout to the sites.

It must be noted that at no time has the federal government ever instructed us to stop investigating or that these matter were considered classified. Instead they have moved, covertly, yet effectively, to gain more data for us. It

can be said, that despite some occasionally heavy-handed surveillance, the defense and intelligence agencies, and even NASA itself, have not attempted to cover up this matter, but have instead obtained more data and released it.

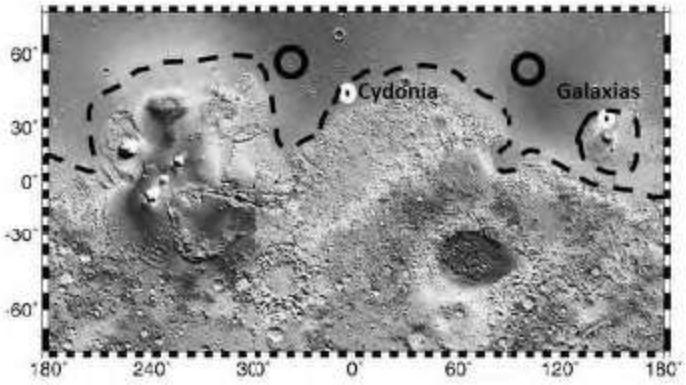
Opposition to our Cydonia investigation, and even mishandling of data, has instead come from the segment of the Mars community that has attempted to preserve Mars for purely robotic exploration. They know that the discovery of a dead civilization on Mars would provoke an American human Mars mission and have thus resisted any attempt to investigate it. Therefore, JPL should be removed from any leadership position in the further investigation of Mars.

It is possible, based on ^{129}Xe, the neutron irradiation, and debris pattern abundances, we can calculate the energy release of the hypothetical nuclear explosions. The results of detailed calculations by several different methods, are included as an appendix in the back of the book, and are stupefying. Based on several different methods the resulting yield is approximately a billion megatons. Such an energy release would be a planetary scale catastrophe and would have wiped put almost all life present on Mars.[15,16]

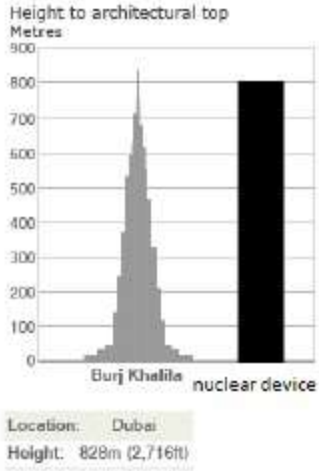
The massive size and apparent deployment from space of the weapons meant they were most likely not Martian in origin. Logically, no indigenous species would blow up its own planet and even if they it did in some moment of gross illogic, lofting such large weapons into space would be unnecessary and difficult-why not just set them off on the surface? No, the scenario of their construction and employment seemed all too clear. Somebody wanted to destroy all life on Mars permanently and created weapons in space and dropped them from space to do this. The pattern was clear; the two centers of archeology on Mars had been targeted by massive nuclear weapons. Their size was only slightly smaller than the Burj Khalifa tower in Dubai. The detective investigation, at least it preliminary phase, was over. The conclusion was clear: Mars had been murdered by some other intelligent entity. Exactly how and why this massacre was committed remained unanswered questions.

Based on a scaled up nuclear device design, a cylindrical shell 800 m tall, 100 meters in diameter, and 10 meters thick, makes for a nuclear device approximately the dimensions of the Burj Khalifa Tower (at 830 m height),

and containing a large fusion core to serve as a source of fast neutrons. Such a device would be delivered from space to Mare Acidalium with a smaller one detonated over Utopia. The devices would be detonated at many kilometers altitude and would, therefore, not create deep craters and irradiate large areas of Mars surface with neutrons, and would create many heavy isotopes by neutron capture, such as ^{40}K, which would decay into ^{40}Ar, and this neutron flux would create deuterium, accounting for some of the isotopic anomalies in that isotope.



Circles mark locations of the nuclear explosions



Approximate dimensions of a hypothetical space-delivered nuclear weapon detonated over Mare Acidalium under the Mars-Dark Star scenario (see Appendix for calculations)

It is possible that, on Mars, we now have the answer to Fermi's great question: "Were the hell are they?" The answer is in the face of Mars and xenon isotopes of the atmosphere around it. The answer is perhaps that they have all suffered the same fate as Mars.

Fermi's Paradox is the apparent radio silence observed in the cosmos and lack of alien contact with the human race by other, far older and far more advanced space faring species whose existence is expected due to the existence of life on Earth. Fermi's paradox has become more acute with the discovery that planets orbiting other stars are common, and perhaps abundant. The cosmos appears to have lots of places like Earth, where life can thrive and evolve as it has here, yet it is as quiet as a cemetery. Fermi's paradox can be explained by a brief lifetime of technological civilizations or at least, their period of transmission of radio and television broadcasts.

The Astronomer Edward Harrison suggested one major factor cutting short the lifetime of civilizations was older predatory civilizations who would wipe out young civilizations once they became detectable through radio broadcasts. The motivation for such genocidal actions would be to avoid later competition.[17]

Given the large amount of nuclear isotopes in Mars atmosphere resembling those from hydrogen bomb tests on Earth, Mars may present an example of civilization wiped out by nuclear attack, and thus the resolution of the Fermi Paradox may lie within easy reach of the human race. It is possible the Fermi Paradox means that our interstellar neighborhood contains forces hostile to young, noisy, civilizations such as ourselves. Such hostile forces could range from things as alien as AI (Artificial Intelliegnce) 'with a grudge' against flesh and blood, as in the movie ***Terminator*** all the way to things as sadly familiar to us as a mindless humanoid bureaucrat like Governor Tarkin in ***Star Wars,*** eager to destroy planet Alderann as an example to other worlds.

In either case, the most dangerous thing to intelligent life in the Cosmos may be other intelligent life. If this is so, discovering this fact on Mars may allow us to prepare to survive any confrontation with such forces. Therefore, the author suggests that the Cydonia and Mars nuclear data be viewed in the context of the Fermi Paradox and appropriate efforts to explore Mars with human archeologists be undertaken immediately.

Here is the Working Hypothesis concerning Mars at our present state of knowledge: Mars appears to become the home of life at the same time as Earth, but cooled earlier and achieved intelligence before Earth, ultimately having held a primitive civilization that built massive monuments which we recognize now despite some erosion. The civilization was global and concentrated in the northern hemisphere of Mars near its ocean. But Mars was destroyed by a space power, like the planet Alderan in the movie ***Star Wars.*** A second, advanced space faring civilization appears to have discovered them and destroyed them by a combination diverting an asteroid into the North of Mars followed by two massive nuclear weapons detonated in midair so as to spread radioactive fallout around the planet. The purpose of the two nuclear weapons would be to kill any surviving intelligent life and to prevent the recovery of Mars biosphere to its former splendor. The 2nd species wanted Mars to never recover and become forever Moonlike. It was as when the Romans destroyed Carthage. They leveled the city and then sowed the fields around it with salt to poison them, so the environs of Carthage could never support a large population again. Thus, under this Working Hypothesis, there exists intelligent technological forces in the universe that destroy more primitive civilizations when they discover them. On Mars, under this Working Hypothesis, some of their handiwork has been preserved.

This is a dreadful hypothesis, admittedly, yet it is the simplest hypothesis that matches the data as we now know it. Eerily, this matches a scenario portrayed in the seminal sci-fi classic ***, Dark Star,*** from 1974 and directed by John Carpenter, where a spacecraft roves from one Solar System to another, dropping planet destroying Thermonuclear weapons to destroy planets deemed “unstable” and thus a threat to future colonization.

In the opening scene the spacecraft destroys a red, Mars-like, living planet. It then continues on its remorseless mission until “Cosmic Karma” catches up with it and its dysfunctional crew. The reason for the silence of the stars, despite their obvious fecundity: the Fermi Paradox, may lie in the ruins of Cydonia. Perhaps Mars was visited by a ***Dark Star.*** For this reason, the human race must move quickly to occupy Mars and explore what transpired there to the maximal extent possible, this is the best way to avoid sharing Mars’ fate.

The approximate age of this nuclear holocaust on Mars is similar enough to the time frame of the Great Permian extinction on Earth, 250 million years ago, that an effort should be made to check for isotopic anomalies in strata of that time frame, to see if a thermonuclear event also occurred on Earth.

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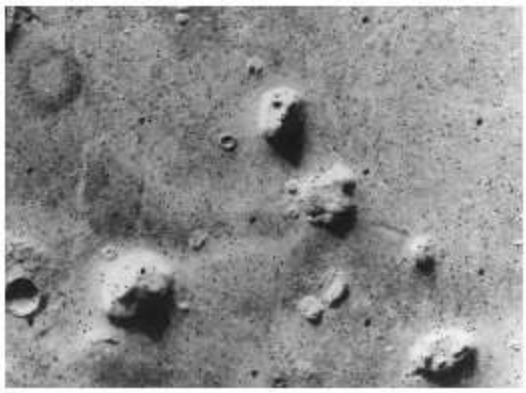
Chapter 7 Cydone and Galaxias



The Face in Cydonia discovery image from 1976 NASA release "head"

Looking back on the journey, it is hard to believe that the crude but intriguing images of the pyramids of Elysium and the discovery frame image of the Face in Cydonia could have triggered the discovery of a dead civilization on Mars and detailed examination of objects millions of miles from Earth in the effort to find the truth, but that is what has been done. That it has been done is a testament to human intellectual and technological ability and the stubbornness of a group of independent thinkers.

It is now apparent that life not only began on Mars in a manner similar to Earth, but that it evolved similarly, producing an indigenous humanoid culture that carved artifacts similar in detail to those found on Earth. It is also apparent that this culture was as acquainted with tragedy on a massive scale as this species. As was discussed, the indigenous culture of Mars apparently managed to attract the attention of someone else who viewed their vigor and intelligence as an eventual threat, and this space faring species then destroyed Mars utterly. At least, that appears to be the simplest hypothesis that can be formulated given the present imaging, geochemical and nuclear data.

Primed by the discovery of the Pyramids of Elysium, followed by the discovery of the Face on Mars by Tobias Owen, then prompted by the work

of Walter Hain, DiPietro and Molenaar, we investigated the images thoroughly and discovered the D&M Pyramid, of similar size as the Elysium Pyramids. This prompted the formation of the IMIT (Independent Mars Investigation Team) that was formed by Richard Hoagland in late 1983 to further the investigation, and resulted in scientific paper being presented at the second Mars Conference in Boulder Colorado in July 1984, where it was suggesting that the Cydonia Mensa objects and objects found at other sites were possibly archeological. This paper also presented evidence that Cydonia Mesa was on the shoreline of a Northern Paleo-Ocean, first suggested by Chandler.[1] As analysis of the Viking data continued, a picture emerged of a Martian paleo-environment that was much more Earthlike than was previously thought. Liquid water is essential to life and defines a Terrestrial environment conducive to life. Thus, evidence for widespread archeology and long-lived past Earthlike conditions on Mars was found in the same investigation, and the two interpretations reinforced one another. The concept of a long-lived period of Earthlike climate biology on Mars is termed the New Mars Synthesis.[2]

It has now been established that life began very early on Earth, before 3.5 Billion years ago, suggesting that biology is a natural and likely process in the cosmos. Panspermia is the probable cause of life on both Earth and Mars, a seeding from a common source in space. That this discovery throws into grave doubt the idea that life originated spontaneously on Earth from "Primordial Soup," is a problem for biologists that I will not explore further. Suffice it to say that one will begin to hear that life probably began in the universe "long ago, in a galaxy far, far away…" But that will not concern us here.

The existence of life on Earth is associated with the appearance of a liquid water environment. There exists no scientific reason that life would not have appeared on Mars under similar conditions and with similar promptness. Under Mediocrity, if liquid water had existed on Early Mars, then life would have existed with it. Estimates of Mars planetary inventory of water greatly increased the hypothesis of a Northern Paleo-Ocean was made formally by the author and supported by Parker, who proposed long-lived seas and lakes at the same conference.[3] Subsequent investigation has supported the Paleo-

Ocean hypothesis.[4]

Adding to the emerging picture of a Mars with a more Earthlike past is the discovery of Mars meteorites beginning in 1979 and the discovery of signs of liquid water exposure in these meteorites prior to their ejection from Mars. Reexamination of the data obtained in the Viking Life Experiments by Levin[5] established the possibility that extant microbial life was present in the Martian soil at the landing sites. Finally, examination of the 4.5 Billion year old Mars meteorite ALH84001 shows evidence of life on Early Mars. Thus, the objections to the archeological interpretations of the images based on the idea that Mars was never Earthlike long enough to produce an indigenous humanoid intelligence are refuted. Mars apparently was the home of life, that like us was abundant and changed Mars' environment, creating a 'Martian-Gaia,' and in the massive biosphere, life progressed farther than anyone imagined.

Based on this emerging picture of a more Earthlike Mars past and careful analysis of every possible image of the possible artifacts at Cydonia Mensa, Galaxias Chaos and other sites, plus the planned launch of the Mars Observer spacecraft with a camera to reimage Cydonia, the CH (Cydonian Hypothesis) was proposed.[5]

The CH was proposed based principally on the Assumption of Mediocrity, the concept that humanity, and Earth and its biosphere are not remarkable in the Cosmos, but part of a common phenomenon in the Cosmos. The Assumption of Mediocrity forms the cornerstone of all SETI (Search for Extra-Terrestrial Intelligence) efforts because it suggests that signs of extraterrestrial intelligence will be recognizable to human beings. Under Mediocrity, finding signs of archeology on a planet with an Earthlike past is to be expected. Further, under Mediocrity the archeology would be expected to be recognizable and share artistic and structural details with Earth archeology because it is made by people similar to ourselves.

The CH was formulated and published in 1991 in order to have a falsifiable hypothesis in place to confront the anticipated new imaging data from the Mars Observer. It was the simplest, falsifiable, hypothesis that could be formulated based on evidence of past Earthlike climate on Mars and the imaging data suggesting Earthlike archeology because it proposed only the

same process of life and evolution that had been observed on Earth. That is the CH was the simplest hypothesis because it proposed no new processes, only a new locale for processes already seen on Earth: life, humanoid intelligence and archeology. Since the Cydonian Hypothesis proposed that the source of the artifacts was a Martian-evolved, indigenous culture, termed Cydonians, any data suggesting a former liquid water environment on Mars, and any data suggesting past Martian biology, were both relevant and supportive of the CH. Therefore, the CH was as much a hypothesis about Mars' past climate and biology as it was about possible archeology on Mars. However, in particular, the CH predicted that since the artifacts were the product of an indigenous Martian culture, assuming Mediocrity, the artifacts would be like Earthly archeology. That is, the artifacts would be meant to be observed at close range by their builders, rather than simply being crudely "bulldozed" into the Mars surface to be observed from space. If the CH was supported, the new images, therefore, would not only confirm the basic structures of the artifacts but show "despite erosion" new anatomical and artistic details plus structural details such as "brickwork." Thus, the confirmation of the Cydonian Hypothesis would consist of further evidence of abundant past Mars water, the medium of life, and evidence of past Mars biology, but also, despite the erosion expected in any Earthlike climate with liquid water, show new anatomical or artistic details and brickwork.

Of course, because of its loss near Mars, no data was returned by the Mars Observer, so it was necessary to wait until a new probe, the Mars Surveyor, could be launched to replace Mars Observer. However, partly because of the Cydonia controversy, public interest and support for Mars exploration increased. Accordingly, because of the successful landing of the small Sojourner Rover and its data, further analysis of the Mars Viking data and the new geochemical data from the Mars meteorites, the picture of a warmer, wetter early Mars was solidified, and by this the CH was slowly strengthened.

Now, because of the avalanche of new imaging and geochemical data obtained from Mars, it is possible to evaluate the predictions of the CH against the new data, to see if it is confirmed or falsified. Study of the Olmec heads and Egyptian Sphinx, the closest Earth analogs to the Faces on Mars, have also yielded predictions of anatomical and artistic details for comparison

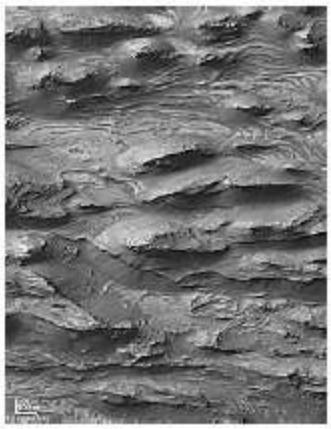
with new images. As can be seen in early images of the Sphinx and Olmec heads, archeology on Earth shows evidence of erosion due to a dense atmosphere with winds and liquid water. Thus, erosion of artifacts is a feature of the same climate conditions that make human civilization and its artifacts possible on Earth.

As the author will show, the CH has been strongly confirmed, with all that that implies.

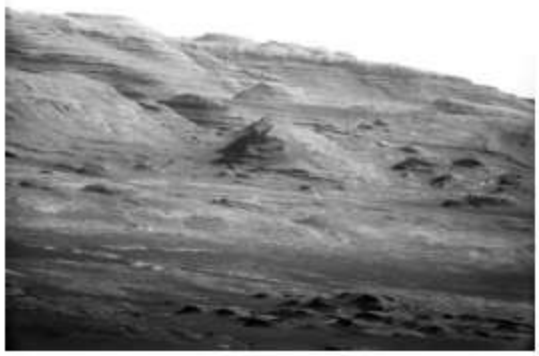
Here, we will briefly summarize the geochemical and imaging data that demonstrates that a warm-wet Mars existed for most of Mars' history- a state of Mars so different from its present state it can only be called "Mars–Gaia".

We will also present and discuss the new imaging data from two areas of Mars that were both imaged at high resolution during Viking, showing the most provocative objects, and having subsequently produced the most new images. These new images show the predicted anatomical and structural details found on the possible artifacts in Cydonia Mensa. Following this, we will discuss the new images from Galaxias Chaos (Utopia) and what they reveal. Finally, we will summarize these findings and discuss the imperatives that they present to humanity.

The CH requires Mars to have been Earthlike in climate and environment for most of its geologic history, a time period similar to Earth's 4.5 billion years of liquid water surface conditions. This, in order for an Earthlike process of biological evolution to occur on Mars and produce something like ourselves, who could then build the artifacts that appear in the images, resembling Earth archeology. Since 1991 orbiting probes and surface landers and rovers have uncovered a large body of confirming evidence of persistent liquid water in Mars' past. Water is life- because it makes possible all the chemical processes conducive to life on Earth, and life is present in every liquid water environment discovered on Earth. The presence of large amounts of liquid water defines what we call a Terrestrial environment. Such large amounts of liquid water were present on Mars.



Exposed sediments showing billions of years of equivalent Earth geologic history on Mars

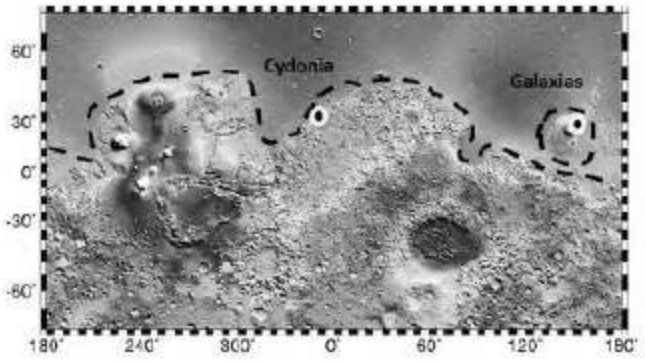


Exposed Sediments on Mars

Our concept of Mars past has undergone, literally, a “sea change” since the original Viking data was gathered. Evidence of liquid water in massive quantities, moving, flowing and standing on the Martian surface for long periods is now seen everywhere. The Paleo-Ocean first hypothesized by the author and (christened the Malacandrian) after the name of Mars in the C.S. Lewis ***Perelandra*** trilogy, has now been supported by a vast array of geochemical and imaging data from Mars.

We now know why Mars is red; it had a vast amount of free oxygen in the past as first proposed by Sagan.[6] The discovery of Hematite and Goethite, forms of highly oxidized iron, in an aqueously formed state, in vast quantities on the Mars surface confirms that Mars had not only oceans, seas, and lakes, but also had free oxygen. The redness of Mars is due to the high oxidation

state, ferric, of the abundant iron bearing minerals on is surface, and, as seen in the walls of great Martian canyons, in the sediments seen exposed on its walls. Add to this, the evidence of oxygen in the ground water that infiltrated the parent rocks of the Mars meteorites before they were ejected from Mars. The presence of the free oxygen also explains the nearly complete absence of carbonates on Mars despite it apparently having a dense CO_2 driven greenhouse. Like Earth, the presence of a biosphere both stabilized and modified the climate to make it more conducive to life, a "Martian Gaia."[2] Oxygen, generated by photosynthesis in the form of normal molecules generated an ozone layer, protected the Martian biosphere from UV and also stabilized the CO_2 greenhouse from carbonate formation at the surface. Oxygen forms acids with SO_2 and with organic compounds to acidify the Paleo-Ocean and recycle CO_2 back into the atmosphere. The dissolved CO_2 in the ocean served as an atmospheric pressure buffer against perturbations such as large impacts. A Mars biosphere allowed a Martian–Gaia.



The approximate Northern Martian Paleo-Ocean shoreline (dashed line) and locations of artifacts, Cydonia Mensa and Galaxias Chaos

An Oxbow lake, evidence of long-lived Earthlike conditions on Mars

The Mars Paleo-Ocean bed is on the Northern plains of Mars, its youngest geologic units This indicates that the Mars ocean persisted for most of Mars' geologic history. Martian meteorites have provided much supporting evidence for this scenario, including most importantly the fact that the Martian surface is younger than previously thought, based on crater counting chronologies. In order to reconcile the young ages of the Martian meteorites, the Mars impact rate must be 4xLunar to provide large source areas on Mars of young age to produce the Mars meteorites.

The CH required a long lived biosphere, but it also requires the death of this biosphere, and an agency for this death is most likely provided by the nearby asteroid belt. The biosphere and Paleo-Ocean-stabilized climate system of Mars was robust enough to survive small impacts, but, as was shown by Sagan et al., a heavy CO2 greenhouse on Mars is unstable to large chilling events that allow the temperature at the poles to fall below the sublimation point of CO_2 into dry ice.[7] A large impact, plunging the planet into a deep low temperature that froze the Paleo-Ocean surface could thus lead to CO2 snowing out onto the poles and thus destroying the greenhouse. The Martian Gaia would thus perish.

The impact that may have caused this catastrophe is the one that formed the Lyot Impact basin. The basin is a double ring crater that at 110 km diameter is as large as Chixulube on Earth. Such an impact, which killed most life on Earth, occurred on Mars at the beginning of the Early

Amazonian Epoch.[8] The Lyot impact would have left Mars in a deep freeze with low atmospheric pressure, during which the oceanic ice sheet would have retreated to form an ice mound trapping the CO2 at the poles and driving it into the groundwater to form subsurface carbonates by basal melting. The Lyot Impact basin is near Cydonia Mensa, however, and therefore must be viewed with suspicion.

Another planetary-scale catastrophe apparently occurred ***after*** the ocean basin emptied. Perhaps by a million years. This event was nuclear and has been hypothesized to be due to a massive nuclear weapon. The location of the apparent nuclear events are in Mars Acidalium near Cydonia Mensa with another possibly smaller event in Utopia Planum.

Therefore, Mars apparently died twice, once by ice and again by fire. These events can be estimated to have occurred approximately 0.5 Billion years ago, based on approximately 4x Lunar Martian cratering rate chronology.

The collapse of Mars climate would have one benefit for humanity. It would slow rates of erosion dramatically on any large archeological relics left on Mars, so that they could be discovered later.

Erosion is the natural consequence of any Earthlike environment. The same environment that would allow humanoid life forms to carve large artifacts also erases them in time. Eroded artifacts, provided they contain enough surviving detail to be identified by artifacts, are what we would expect to find if Mars was once a Mars-Gaia and supported intelligent life before its catastrophic (that is -brief on geologic timescales) transition to its present climate.

The presence of erosion, while creating difficulties in studying details of the artifacts also verifies the Cydonian Hypothesis because it demonstrates the climatic conditions consistent with Earth-like artifacts. Thus, under the CH, any artifacts must bear signs of erosion.

The Sphinx before partial restoration. All Earthly archeology shows some signs of erosion

We are guided in our consideration of new imaging data from Mars by Mediocrity. That is: our assumption that archeological relics found on Earth are not remarkable. That is, if Mars was like Earth in climate for geologically long period, as it seems to have been, we would expect Sphinxes and Pyramids, similar to those found in Egypt and Mexico.

The Sphinx under different lighting and viewing geometry. These different conditions coupled with erosion, can produce dramatic changes of appearance

2004 Mars Odyssey image V10598012 of the face of "Cydone"

Despite obvious erosion, the eyes, nose, mouth and helmet ornamentation are clearly evident.

The D&M pyramid was also imaged.

High resolution image of the D&M Pyramid MGS MOC Release No. MOC2-484

Not only was its overall 5-sided symmetry confirmed, but the new high resolution images revealed what appears to be a collapsed rectilinear region of brickwork, where bricks were apparently used for facing the pyramid to protect it from erosion, and collapsed in one rectangular region and produced

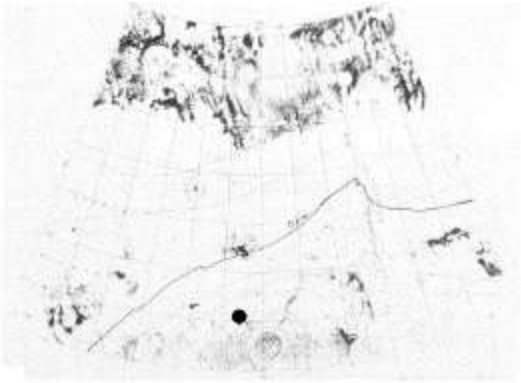
a small landslide.

The pyramid-like object imaged in Deuteronilus Mensa was reimaged by Mars Odyssey but while still geologically anomalous, appears to have suffered much erosion. Given the strength of the case for artificially of the objects at Cydonia, the Dueteronilus site should be targeted for further investigation; however, all archeological finds on Mars, if they truly date from a more Earthlike past, must suffer from erosion of one degree or another. In the case of Deuteronilus, the erosion appears to be extreme.

The Crater pyramid imaged in Deuteronilus by Mars Odyssey

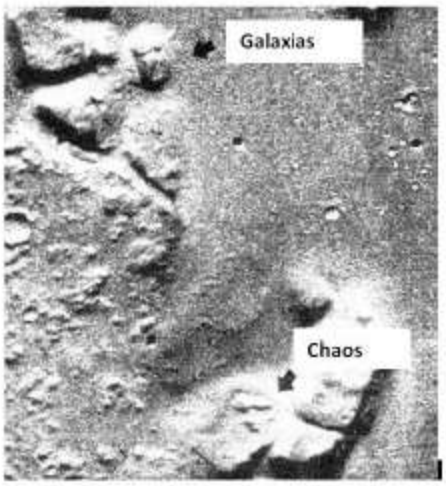
Therefore, the new images of the two most provocative objects in Cydonia Mensa, allowing for erosion that affects all Earthly archeology, strongly confirm the CH, which states that the objects would show increased anatomically and architectural details at higher resolution. The fact that they also show erosion confirms that they were created in a time when Mars had more Earthlike climate and erosion rates. This is supported by new images of objects in Utopia (Galaxias Chaos).

The faces (here called Galaxias A and B) were discovered by the author on Viking frame 86A10 and subsequently investigated further using frames 541A453, 243S01 and other lower resolution frames. These images confirmed the face-like structures seen in 86A10.



A map of the Utopia region showing site of Galaxias Faces

The objects were discovered by the author using an archeological site model developed at Cydonia Mensa to find a similar site. Galaxias A (here christened Galaxias) resembles the face in Cydonia, though on approximately 2/3 scale. The face appeared complete, with two eyes, nose mouth and helmet like the Cydonian face. It was noted in the original publication of the Cydonian Hypothesis that the object most resembled the face.



Galaxias Face A "Galaxias" and Galaxias Face B "Chaos" are seen in portion of 86A10

"Galaxias" and "Chaos" are seen in portion of Odyssey
THEMIS Image I02816002

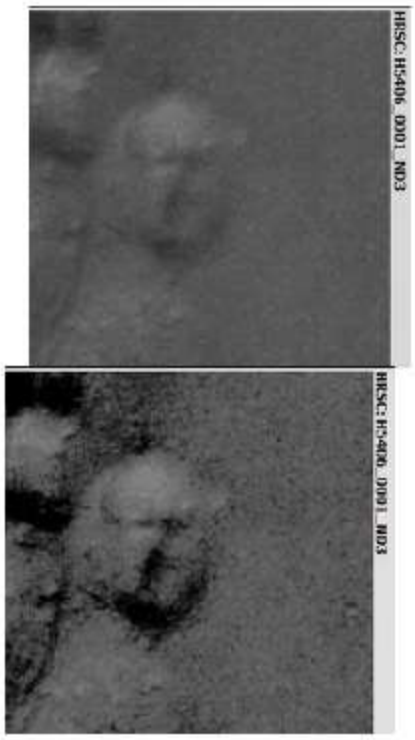
Three new images of the Galaxias Face A have been obtained. They confirm its overall resemblance to the Face in Cydonia: face-in helmet structure, ornamental details and presence of erosion.

It is the only object imaged at high resolution (Galaxias B was somehow excluded from both Odyssey and MRO images) It can be seen that Galaxias A shares apparent ornamental details with the face in Cydonia: what appear to be marks on the cheeks and an indention over the left eye, as indicated in the original CH publication[1].

The Odyssey image confirms the resemblance of the face to the face in Cydonia and the presence of shared ornamental details, such as the cheek ornaments and indentation over the left eye. Helmet ornaments also appear present.

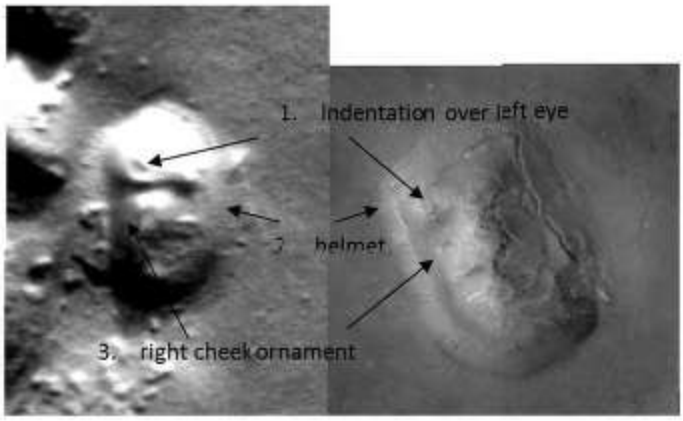
Galaxias Face, a Viking image

Galaxias Face A, 2006 MARS ODYSSEY image V22286011 from directly above



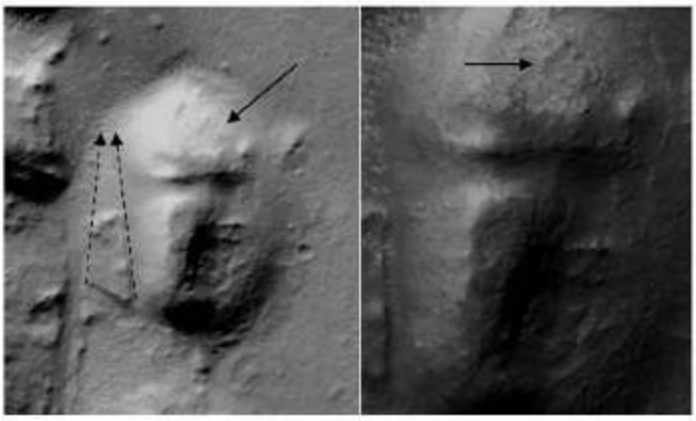
An Image of Face 1 from European Express High resolution image H5406_0001_ND3 , (top)and a contrast enhanced version (bottom) showing eyes, helmet and mouth

In the original article CH article, it was noted that Viking images of the faces in Galaxias (Utopia) shared ornamental details with the face in Cydonia, in it is seen that the new images confirm these shared details. Such shared details are consistent with cultural equilibration around the shores of the Northern Ocean and therefore supports the CH.

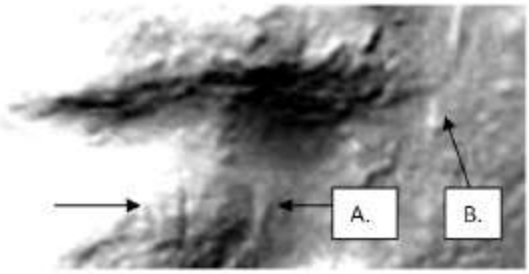


Comparison of new Cydonia and Galaxias images confirming matching details between faces

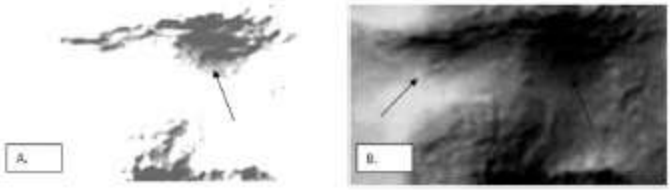
The MRO images appear to show the face has suffered an erosive fissure along its length. However, the new image also shows apparent symmetric brickwork on the nose of the face.



Galaxias Face A, MRO images P04_002714_2144_XI_34N212W and P14_006683_2131_XN_33N212W at oblique angle. Helmet ornaments are seen (solid arrows) in both images. A 'frame corner' geometry similar to the Earthly Sphinx is seen also (dashed arrows)

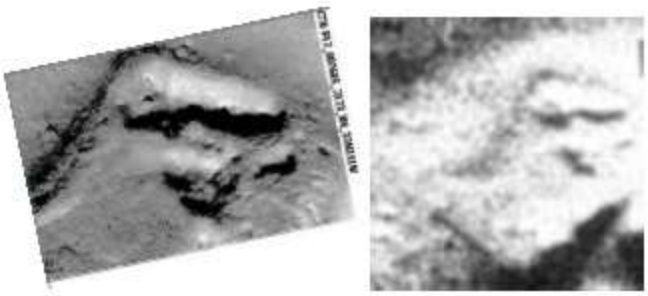


Enlarged portion of Galaxias Face, a MRO image P04_002714_2144_XI_34N212W showing eye and nose bridge area, A. symmetric brickwork is visible on each side of the nose (arrows) and B. frame-corner near right eye (arrow)



A. Apparent Pupils in eyes seen in MRO image of high brightness Galaxias A enlargement, and B. pupil identified in right eye at lower brightness

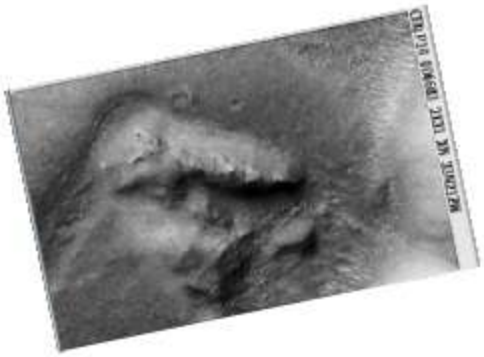
Similar face from Mexico



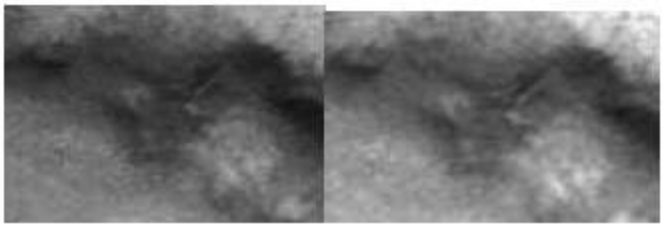
A contrast enhanced image of Face B from MRO context image P17_007685_2133_XN_33N211W and comparison image from Viking image 86A10

Image of Galaxias Face B from Mars Express frame H2907_0008_ND3

Utopia Face 2 in Viking frame 243S01 , showing apparent face brow and nose



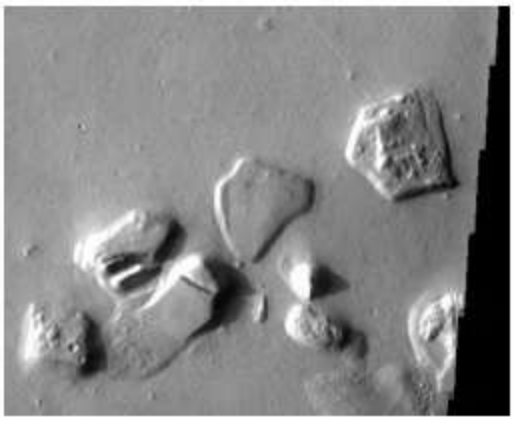
MRO Image of Galaxias Face 2 from P14_006683_2131_XN-33N212W. Nose nearly disappears under this lighting due to low relief



Nose "brickwork" from MRO Images of Galaxias Face B from P17_007685_2133_XN_33N211W and P14_006683_2131_XN-33N212W

Images of Face B in Galaxias Chaos have also been recovered, but appear to show a highly eroded object. Based on “brickwork” apparent in the nose area in two high resolution images, the alignment and proximity of face B to Face A in Galaxias Chaos, and its overall appearance, the author favors the interpretation that the object is a highly eroded partial “face” carved into a cliff at low relief.

Therefore, the new images of Galaxias Face A or “Galaxias” appear to strongly confirm the overall resemblance of the object to the larger Cydonia face and also confirm shared details. The MRO image also displays evidence of fissuring of Face A but also symmetric brickwork on the nose area. Accordingly, the Galaxias Face A, is an apparent eroded artifact like that of Cydonia and also the product of similar global Cydonian culture on the shore of the northern Paleo-Ocean. Galaxias Face B also appears to be confirmed in general appearance but also appears to be highly eroded compared to either the Cydonia face or Face A, but does appear to have retained “brickwork” around the nose.



New image of strange mesa near Galaxias Faces

Based on evidence that Mars and Earth evolved with a liquid water environment on their surfaces for most of their history, as evidenced by an ocean bed on the youngest part of Mars, the high oxidation state of Mars’ surface and sediments, plus evidence that biology began early on Mars, as on Earth, and persisted for most of its geologic history, and finally, higher resolution images of the face and D&M pyramid in Cydonia Mensa showing

apparent brickwork and new anatomic and artistic details not seen in Viking Images, and the new images of the face “Galaxias A” in Galaxias Chaos (also called the Utopia site), confirming its similar structure to the face in Cydonia Mensa as well as new details suggesting brickwork, the author now concludes that the Cydonian Hypothesis has been confirmed. That is: apparent eroded archeology exists from a dead indigenous civilization on Mars at several sites consistent with a long-lived and evolved biosphere on Mars in the past, as on Earth.

The existence of a dead humanoid civilization on Mars is completely consistent with its apparent long-live Earthlike past climate and the Principle of Mediocrity, the idea that humanoid intelligence is not exotic or miraculous, but is a natural consequence of any long lived Earthlike biosphere. This Martian civilization apparently perished due to a planet-wide catastrophe of apparently genocidal origin that destroyed the indigenous civilization and altered Mars’ climate from being Earthlike to its present state in a brief period compared to geologic time. Unfortunately, nuclear genocide on a planetary scale is also a concept in keeping with Mediocrity that we almost saw on Earth.

The discovery of a dead civilization on Mars, whose end was apparently catastrophic and due to nuclear causes, suggests that the cosmos can be a dangerous place and requires a vigorous response from the human race, to reduce the probability that we will perish the same way. For this reason we must maximize our knowledge of what transpired on Mars, and this requires an international human mission.

A human mission to Mars is now imperative. It must be a oneway mission, with a permanent human occupation and settlement of the planet following. Mars and the biosphere and culture it apparently supported are dead. The magnitude of such tragedy requires an intelligent response from us of equal magnitude. We must find out why they, and the planetary biosphere that they were part of, perished. This requires both human beings on Mars to maximize knowledge as much as possible of the life and death of Mars and also the acquisition of human skill in astronautics to accomplish this feat. Both acquisitions will increase the chances of humanity not sharing the fate of the Martian culture. Knowledge is our best defense against the unknown.

The most likely source of this tragic mass extinction on Mars once appeared to be the formation of the Lyot Impact basin, causing collapse of a long-lived planetary greenhouse system. Mars is next to the asteroid belt and thus may have endured large impacts far more frequently than Earth. However, the nearness of the impact to Cydonia and the close proximity of the impact to the centers of the nuclear explosions, also identified on Mars, mean that this “death by natural causes” is no longer a viable hypothesis. Sadly, the simplest hypothesis now appears that these catastrophic events were connected and that some space power arrived and decided to wipe out the apparently primitive indigenous civilization on Mars and render the planet uninhabitable.

The chances of preventing such an occurrence on Earth, with humanity becoming extinct, are much lessened by humanity acquiring deep space faring ability and becoming a multi-planet species. However, we must find out the exact scenario by which Mars lived and died and not be content with hypothetical scenarios that seem simplest. When intelligent agencies are involved, the possible scenarios become myriad. But one of these possibilities is the scenario of hostile advanced spacefaring species roaming the galaxy and “nipping in the bud” young indigenous civilizations such as ourselves. We must make ourselves as safe as possible, and we do this by becoming as spacefaring as possible and going to Mars and finding answers.

The confirmation of the Cydonian Hypothesis, the discovery of a dead civilization on the first terrestrial planet in the cosmos that we could examine, means that the cosmos contains still other intelligences in other star systems. Planets apparently abound in the cosmos, and based on Mediocrity, most Earthlike planets will bear intelligence eventually. Under the Principle of Mediocrity, such other intelligences may share many behaviors with human beings, such as construction of large monuments, and acquiring the ability to travel in space. These behaviors will also include some that humanity now struggles to avoid, one of which is genocide. Again, the surest way to maximize both human knowledge and survival skills in a harsh cosmos is to become spacefaring in response to what we have found on Mars. This is not just because of what this discovery implies about the fragility of life on Earth, but also because of what this discovery implies about the rest of the cosmos we live in. Accordingly, we must rise to the challenge of Mars and what it

says about the cosmos by becoming as skilled as possible in moving out into it. Mars is obviously the first place humans should go. We must be prepared for what we will probably find there.

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Chapter 8 The Coming Mars Crisis

"The fault lies both in the stars and in ourselves Cassandra, for we are both part of the same thing"

Pamela Monroe, *Morningstar Pass The Collapse of the UFO Coverup*

A Mars Crisis looms. We face a crisis because the cosmos now demands actions from the human race that it is barely capable of, but now must do rapidly. We must send humans to the Mars system to investigate and occupy it, making it part of the human realm. We must do this with all appropriate speed. Of all the nations of humanity, only the United States can accomplish this task, aided by the space station consortium. ***However, we are well-able to do what is required of us now.***

The Cydonian Hypothesis has been confirmed, but it cannot be said to have been proven. It will not be proven until a human being stands on Mars and holds a piece of identified archeology in their gloved hands. More investigation is required. But what should be the process of investigation from this point forward?

For now it is a question of risk and probabilities. What is the risk, for instance, of ignoring the evidence for a dead civilization on Mars that was probably wiped out by someone else using massive nuclear weapons? It must be remembered that we live in a silent universe, and this makes Earth's exuberant broadcasts all the more likely to attract attention. This means if the working hypothesis is correct, hostile entities like the one that wiped out Mars may have already detected us and are preparing to come here. They could arrive in a hundred years, they could arrive tomorrow. Therefore, to maximize humanity's future survival chances, we must move quickly to investigate Mars intensively and develop spacefaring capabilities as rapidly as possible. That is the safest course of action.

To do otherwise, to ignore the Mars data and assume it means nothing, is to tempt fate in an unknown universe that is already known to be dangerous. Nature, even without predatory intelligences being present, deals in

catastrophe and mass death, and those who do not recognize this fact of life become extinct. Nature also provides only a few subtle warnings of coming disaster, a streak of light against a background of fixed stars on a photographic plate-telling of another Chixulube asteroid, the swelling of a few centimeters in the flank of a long dormant volcano near a city-telling of a coming pyroclastic eruption, the sudden disappearance of spots on the Solar surface-telling of the coming of a new “little ice age”. A more poignant example is the last flight of STS Columbia, where the Air Force informed NASA that Columbia was shedding pieces in orbit and offered to image it using spy satellites. This offer was refused. Fools disregard such subtle warnings; the wise notice them and raise an alarm.

So we must investigate further, we must investigate with all speed. The terrible events that occurred on Mars happened many millennia ago, yet now, in the silent cosmos that we experience, our own radio traffic has made us doubly conspicuous. Might we already have been noticed by hostile intelligences similar to those who destroyed Mars and its inhabitants? We speak here of the implications of a working hypothesis, but dare we wait for proof before taking dramatic action? No, we want to be in the position that once the existence of the dead civilization is proven, we are already well on the road to being spacefaring. What is the best course to follow in the investigation of this terrible discovery? The author urges rapid and wise action to investigate this matter. But we must deal with one serious problem first.

We have already experienced the infuriating situation where fierce partisans of one side of the Cydonia debate have controlled data collection and release and even threatened and assaulted Cydonia investigators at meetings. As a result, MSSS (Malin Space Science Systems) and JPL, who MSSS reported to, can be said to have lost all credibility as objective scientific investigators or further participants in the investigation of this grave matter.

JPL and its contractor MSSS are the adamant proponents of the position that the images and isotopic data from Cydonia mean nothing. They can be counted on to continue telling the public “move along folks, there is nothing here to see”, even as the evidence for a past biosphere, a dead civilization and

its nuclear demise becomes more evident. One could say that is evidence of a government cover-up, but instead it was nothing as noble as that. The United States Government, with its actions viewed as a whole, has apparently single-mindedly pursued the truth about Mars, and its delivery to the public, since the early 1960's. They have brought the public on a collision course with the truth about Mars and kept it on this course. In contrast, the attitude of JPL and its chief contractor MSSS apparently stems from petty institutional and academic agendas that are the inevitable consequence of Big Science. This situation resulted in a scientific atrocity, the April 5, 1998, MSSS release to the public of deliberately misleading images of the face in Cydonia. This was followed by MSSS spokespeople spreading misinformation to prevent the public from seeing the truth. In the history of science, it is hard to find a comparable episode of publically supported researchers misrepresenting data so brazenly. NASA headquarters, to its credit, had ordered the image taken and published; everything else that happened was controlled, unfortunately, by JPL and its contractors, all at taxpayer expense. This situation cannot be allowed to happen again.

Therefore, the first thing that must be done is to remove JPL, who was paying MSSS, and MSSS from all management and data collection responsibility at Mars and bar it from further comment on this matter. It is bad enough that they were parties to a lie. To allow them to continue this habit at taxpayer expense is intolerable. Malin Space Science Systems should be barred from all further work with NASA. Instead, NASA Johnson, aided by University of Arizona at Phoenix, who have run the Mars Odyssey probe, should be placed in charge of further robotic exploration of Mars.

It is the conclusion of this author that the Cydonian Hypothesis has been confirmed and additional data will support it further. A rover should be landed at Cydonia Mensa to examine the ruins there at close range and certify a landing site. However, it must be understood that most remains of any dead civilization on Mars are likely buried under many meters of rubble and a rover can do little to explore this. The chief role of the rover will be thus be to ensure as safe a landing site as possible for the astronauts and to serve as a guidance beacon for landing supplies to support the human landing. Experienced archeologists will tell you that the real work of archeology is accomplished with a shovel held by a human being with keen eyes. That is

the surest way to maximize our knowledge of what happened on Mars and what may happen to us in the future is to send human being to the site to investigate it thoroughly.

Throughout the history of space exploration, the question has been raised of whether human or machine would take the lead in future space exploration. In this debate is mirrored the whole question of whether the future of our civilization would be bound to Earth, or spread amongst the stars. Indeed there are some in the robotic community who insist that the future of intelligence itself is not human, but machine. The latter opinion has no place in this investigation, which is about future survival and good fortune of the human race. It is significant that the primary institution for robotic exploration of Mars was also the fiercest opponent of the Cydonia investigation. They went to Mars to find dead matter and instead found a human face, and rejected it. This rejection was not only an affront to science, but also may have endangered the human race by delaying investigation of matters which may gravely impact human survival in the cosmos. The Cydonia Hypothesis and debate that has surrounded it has thus have produced a tipping point in this debate of human versus machine exploration of Mars. The result, Cydonia and Mars investigation must be primarily a human activity henceforth.

The Face in Cydonia is humanoid and not that of a machine. It speaks of a cosmos where human beings are a natural part of what is, and not an aberration on it. It speaks of a cosmos where human beings are part of a family and must reach out to meet their brethren. The humanoid face in Cydonia must be, therefore, explored primarily by human beings.

Mars is the gateway to the stars. The human knowledge of both astronautics and what happened on Mars must be maximized. **We must answer the question: *Can the events that apparently happened on Mars happen here? Can they be prevented from happening here?*** Finding the answers to these questions requires close investigation by human beings staying on the planet Mars for long periods and occupying the space around it.

As was mentioned earlier, a rover dispatched to Cydonia may be useful to qualify a landing site near the Face, but based on investigation of raw

archeological sites on Earth, a rover's cameras will probably show little but mounds of rubble. An eon of erosion has likely destroyed any exposed artifacts except for large scale structures and buried whatever used to be in plain sight. That is, a rover will be useful to support the mechanics of a human landing in Cydonia, but its chances of seeing anything not seen in images from orbit is very low. What it will likely see is merely some unremarkable mounds of rubble and a few large eroded monuments. Any experienced archeologist will tell you that all real explorations of past civilizations involve a "dig," that is, work with a pick and shovel to carefully expose what nature has covered with millenniums of dust and mud. The goal of this whole exploration effort is to maximize knowledge of how Mars lived and how and why it died and make us spacefaring in the process so that the probability of human survival in the cosmos will be maximized. We must maximize human spacefaring skill so we will have some hope in the future of dealing with whatever forces in the universe destroyed Mars. This requires astronauts transported to Mars surface, with keen eyes, digging carefully with picks and shovels, to expose what is buried and to control the skies above Cydonia. It requires developing interplanetary space transportation systems that grow faster and are more capable with time. It is recommended that these efforts, landing humans on Mars and excavation be done, concurrently with this development.

The best course of action would then appear to be to launch a crash program to occupy Mars and become deep-spacefaring in the hopes that we will both learn what happened at Mars and be armed by this knowledge. This course of action will hopefully create a human realm in the future that any hostile entities would find too knowledgeable, too determined, and too capable to trifle with.

Therefore, what is required now, of the human race is a series of bold steps with a Phase I and Phase II.

1. A bold group of independent scientists drawn from Aerospace, Defense and Academia must examine the evidences put forth in this book to see if they if they are probably true and correctly interpreted. If they agree with this author, then they must report this. In particular: **any isotopic anomalies** associated with the Permian Extinction must be looked for

and analyzed.

2. These results must be reported to Congress. This will begin Phase I of the human response to the discoveries on Mars.

3. Plans must be made for a human Mars mission team to be landed as soon as possible in Cydonia to examine the area at close range for archeology and also examine the soil for isotopic and morphological traces of the nuclear explosions thought to have occurred there. Robotic probes can certainly be useful in preparing the way for a human landing and maximizing its safety, but must be kept in a subordinate role. This is a job for humans. The truth is buried at Cydonia, probably at a depth of several meters. Those who land must be determined to find it. People must be landed to expose and explore the ruins that hold this truth to maximize human knowledge of what transpired on Mars. Let us assume the working hypothesis of a dead civilization wiped out by somebody else is confirmed. This will end Phase I.

4. In Phase II the human presence on Mars must be expanded to be a permanent settlement with frequent resupply and rotation of personnel between Earth and Mars. Mars and the space around it must become part of the human realm. The resources of the Mars system must be exploited in this effort.

5. Spacefaring must become the human future, and this must have a strong military as well as civilian component. The cosmos is as deadly as it is beautiful, and so, apparently, are its inhabitants. This concept must now include us. We must become like the cosmos if we are to tarry long in it.

6. If it be indeed found that Mars was the home of a humanoid civilization that perished in a nuclear holocaust, a solemn memorial service should be held for them, as for any kindred. A memorial on Mars should be erected at Cydonia with lesser ones elsewhere and dedicated to the life of the new inhabitants of Mars and the memory of those who came before.

7. Mars should be resuscitated into a living planet once again, that is, terra-formed, becoming a second home for humanity. That will be the greatest memorial we can build to honor the dead of Mars. This will conclude Phase II and lead to further phases of human response.

It must be realized that an effort to land humans on Mars after discovering a dead civilization massacred by space-borne nuclear weapons is not the same as landing on the Moon. It is a completely different psychological scenario and will be carried out in an atmosphere of a Mars Crisis. Strong provision for the psychological aspects of this investigation in terms of crew and public morale must be made.

The means to achieve a human landing on Mars at the earliest possible time is now proposed. How to do this rapidly, economically, and with reasonable safety in a dangerous universe is a crucial question. The answer has now emerged, based on decades of research by legions of scientists and engineers. The problem of extreme psychological isolation of a small crew landed at the site of an extraterrestrial massacre is addressed in this architecture as a serious problem requiring extra resources. A proposed basic architecture to land humans on Mars to occupy and maximize knowledge of it is presented below.

In order to achieve a human landing on Mars with maximum speed in Phase I, the present and near term family of rocket boosters is exploited as are present an near term human crewed vehicles. Chemical propulsion is used heavily with help from Solar Electric for interplanetary trajectories. The landing of humans at Cydonia will be done by stages as follows:

Stage 1. This will be a rover landing at Cydonia Mensa to investigate the landing area, identify best spots for human excavation, and serve as a beacon for further unmanned supply packages. A probe landing on Phobos will also be made at the earliest possible date to certify a human landing site on this planetoid. This makes use of the basic 900kg rover, Curiosity, and its launch system, the Atlas V or Delta IV, for both probes.

Stage 2. A series of unmanned supply packages will be landing in close proximity to each other guided by the rover beacon. These packages will take advantage of the Curiosity Rover landing system to land 900kg packages. Unmanned landings will also be made on Phobos to preposition both supplies and equipment. Since Phobos is tidally locked, these landings will be made on the side continually facing

Mars.

Stage 3. Dragon or Soyuz-type landing capsules will also be landed to serve as habitats for the ground crew using the rover-beacon. These will make use of fast direct trajectories using the Mars' atmosphere for aero-braking.

Stage 4. A human mission to Phobos will be sent using the SLS with a Solar Electric interplanetary stage. This mission to Phobos will carry ISS space station habitats and establish a human outpost on Phobos, on the side facing Mars, and linked to Earth by circumsolar and circum-Arian satellites for year round communications. Thus a permanent human presence in the Mars system will be established on a planetoid that is easy to rotate crews on and off between the Mars system and Earth. A base at Cydonia Mensa will be set up tele-robotically from Phobos to prepare for a landing team.

Stage 5. A human 3 man crew will be sent by an SLS with a Solar Electric interplanetary stage on a fast trajectory to land directly at Cydonia Mensa. The Phobos outpost will maintain continual communication with the Cydonia landing crew via Mars' satellites. The landing crew will set up a permanent base at Cydonia and begin excavations to discover the nature of the Cydonian civilization. The crew will consist of volunteers willing to remain on Mars for several years.

Stage 6. The Phobos outpost will serve as a psychological and logistical support base for emergency supplies and as a spaceport for the Mars system. A 3 person "early-MAV" (Mars Ascent Vehicle) based on a Dragon or Soyuz capsule will be landed in case an emergency evacuation to the Phobos base is required, but it will not be used except in case of emergency. This system must be tested on Mars by lifting payloads to LMO (Low Mars Orbit) for retrieval by an Orion-derived "space tug" based on Phobos.

Stage 7. Excavations at Cydonia Mensa will begin immediately to expose artifacts of the civilization and samples of rock dating from its demise. These samples will be immediately lifted to Phobos and then sent back to Earth for study on the ISS space station to provide bio-

isolation. This will conclude Phase I of the human response to the discoveries on Mars. It is believed that this can be done, like Apollo, in 10 years.

Stage 8. Confirmation of the Cydonian Hypothesis will be followed by an effort to build a permanent and extensive spaceport at Cydonia, and a program to develop nuclear space propulsion for spacecraft linking Earth and Mars will be pursued. This will be Phase II of the human response: to become spacefaring. With this basic plan laid out we can discuss some issues in more detail.

Mars is not the Moon, where we can wear diapers for the entire 5 day trip. Mars is a 1000 day odyssey. The most dangerous and resource intensive aspect of a human mission to Mars surface is the return. Even using ISRU to manufacture rocket fuel on Mars to reduce landed mass, the ascent from Mars surface to LMO (Low Mars Orbit) requires a powerful rocket to be fueled and launched from Mars. This MAV rocket must be "human rated" and also able to operate reliably after sitting, not in a climate-controlled vehicle assembly building at Kennedy Space Center, but instead on the Mars surface exposed to dust storms and freeze and thaw cycles. Thus the "man-rating" of the early-MAV by launches of payloads to LMO must be done on Mars, with the MAV exposed to the Mars environment.

The Highly successful nuclear powered Mars rover Curiosity

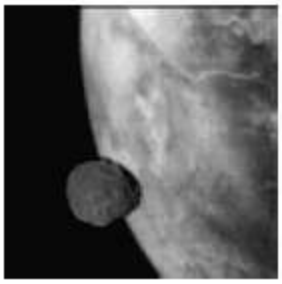
The question must be posed then, in the interest of speed and safety, why not aim for a permanent settlement on Mars from the outset, and test the MAV on Mars concurrently with excavations? The early-MAV is then used as only a contingency vehicle for people, but will be primarily used to

transport payloads to LMO for recovery by Phobos. This recognizes the fact that the ascent from the Mars surface is the most hazardous part of any human Mars mission, a reality now widely appreciated. Therefore, the first crew will land at Cydonia and the early-MAV will be landed remotely and be tested by repeated ascents from the Mars surface of sample payloads while the excavations are being done, but crew rotation will simply be postponed for several years. The MAV will be available for an emergency evacuation of the landing team, but its primary role in the early phases of the investigation will be to ferry recovered samples, Mars water, and artifacts from Mars surface to LMO for retrieval by the crew at Phobos using an Orion derived "space tug." The "early MAV", having been extensively tested on Earth, will use hypergolic fuels like the Moon Lander, and be as simple and small as possible. However, the main mission goal will be excavation and investigation by the landing team and establishment of a permanent base. Thus, the early MAV will serve as only an emergency "no frills" back-up vehicle and precious cargo transporter. Later, with the construction of a spaceport, with ISRU rocket fuel production, and extensive testing at Mars, the goal of lander crew rotation back to Earth can be accomplished. This will defer the dangerous ascent from Mars by the original landing crew until after the construction of a sheltered space-port. This will require a commitment of several years from the landing crew, but it will be much safer than an early rotation. And it will help spare the public from any fatalities during the crucial and intense early phases of the surface mission.

An early-MAV for surface sample transfer to Mars orbit, or an emergency evacuation of the landing crew

The early establishment of the spaceport on Phobos is vital to the psychological and logistical support of the landing crew at Cydonia and the

populace as a whole. It should be named “Base Courage” because it represents, literally and figuratively, the human conquest of fear (Phobos). The landing of humans on Phobos will be an important milestone for the public and reassure them that the US government is taking concrete steps to resolve the Mars crisis. The landing of humans on Phobos means humanity has now begun to occupy the Mars system and laid claim to it. The weak gravity of Mars largest and closest moon means that one does not land on Phobos, one simply docks with it. Landing large habitats or supplies for an expanding base is equally trivial. To escape cosmic radiation, one merely digs into the Phobos regolith several meters. The presence of the base of Phobos means that an early-MAV need only be able to loft people or payloads from the Mars surface to LMO. Once in LMO, the Phobos base can dispatch an Orion capsule derived “space tug” to dock with the MAV capsule in LMO and recover any people or payload for transport back to Phobos. The journey from Phobos back to Earth, compared to the ascent from Mars surface to LMO, is a relatively easy and much safer proposition.

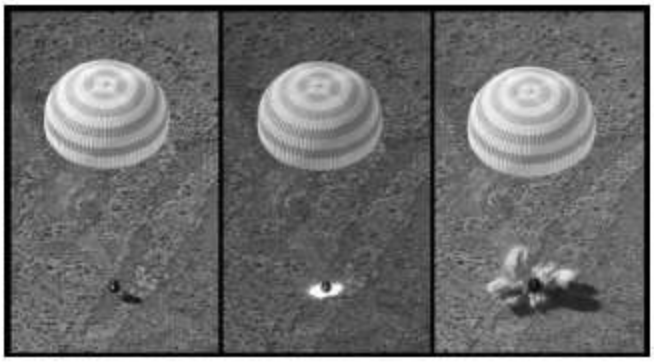


Phobos in its highly convenient orbit around Mars

The Mars Moon Phobos: 27 x 22 x 18km diameter

For a return of people or samples to Earth, one simply “undocks” from Phobos, does a small chemical burn to escape Mars’ gravity and turns on the Solar Electric Interplanetary stage to achieve Earth transfer orbit.

Soyuz ferry in orbit around Earth



Russian Soyuz capsule landing using a combination parachute and retro-rockets and with some modifications, suitable for a Mars landing

It is now well understood that a Mars-Moon exploration program will benefit considerably from utilization of Mars resources and utilization of the moon of Mars, Phobos, as a staging area. Mars resources: atmosphere, water, and moon system can reduce cost and risk for a human Mars mission and should be utilized carefully. In particular, the Martian atmosphere will be used for aero-braking to reduce fuel requirements for a landing and the Martian moon, Phobos, will be used as a forward base.

Soyuz capsule after landing

Orion space capsule

ISS space station has demonstrated living in space for long periods and large scale solar power

The space station can test several habitats for the Mars transit and a Phobos base

Lunar resources can strongly contribute to an eventual interplanetary system connecting Mars and Earth. However, the initial effort to put humans on Mars must go directly to Mars and Cydonia with no distractions. Phobos,

Mars' inner-most moon, used as a staging area gives considerable advantages to Mars compared to the Moon as a final destination and can partially offset the problems of Mars distance and higher gravity. Considerable advantage can also be obtained with elements of Mars architecture being tested in space on the ISS (International Space Station) or derived from its proven hardware.

It is also understood that nuclear power, while essential for Lunar and Mars bases will cause political complications, delays, and additional expense for a Mars program if it is applied to propulsion. Nuclear reactors do not become filled with dangerous radionuclides until they have been turned on and operated for a period. Doing so with a reactor safely nestled in a crater on Mars will pose no danger to Earth. However, such an operational reactor flying around in space will raise alarm among reasonable people. These complications may cause nuclear propelled Mars Mission plans to be derailed or recast by a change in administrations, even if the incoming administration actually favors a Mars mission. Because a Mars mission effort will likely bridge several administrations, it seems best to create a mission architecture using advances in Solar Electric power generation and plasma propulsion, in addition to ISRU (In Situ Resource Utilization) to create a Mars mission architecture that is politically sustainable yet capable and cost effective.

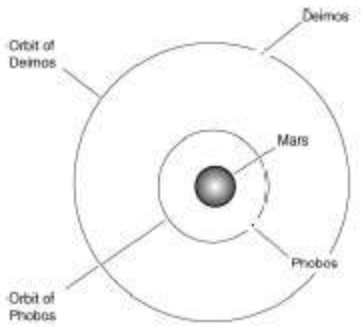
Mars is not just a planet, but a system consisting of a planet and two moons in almost equatorial orbits. The moons are not large, both being potato shaped with Phobos being 27 km on its longest axis and Deimos being 14km. The orbits are quite circular at approximately 3 and 7 Mars radii for Phobos and Deimos respectively. The common complaint about Mars lack of a strong magnetic field is a plus at Phobos, for Mars also lacks Van Allen belts. This makes the radiation environment at Phobos fairly benign. Both moons are in synchronous rotation and thus are tidally locked, keeping the same face towards Mars.

Phobos, being the largest and closest to the Mars surface is of the most interest for supporting human exploration of Mars. Phobos is a ready-made space station. It orbits Mars approximately 3 times a day and thus rises in the West and moves across the sky to set in the East. Its image from the surface will be roughly the size of a half-Moon from Earth. Surface gravity on Phobos is very weak so a human spacecraft will basically dock with Phobos

rather than landing on it. The mean density of Phobos is approximately twice that of water so Phobos' regolith can be moved easily and used for radiation shielding.

Phobos' importance to an American Mars mission is more than just a convenient staging area. A landing on Phobos also is an important goal in itself. A landing on Phobos represents a first human beachhead in the Mars system and an important milestone in human expansion into the Cosmos. It also represents to the public that like the Apollo 8 Lunar orbit mission captured the imagination of the world and convinced humanity that the Apollo program would succeed, so will the first steps by astronauts on the surface of Phobos. "United States Conquers Fear (Phobos) at Mars" will read the headlines. Phobos-station will then become the "base camp" to support human exploration and settlement of the whole Mars system. It will be a secure "home away from home" for the following human Mars expeditions. Phobos-station also serves, together with a supporting Mars communications satellite constellation, the short-time-lag leg of a tele-robotics effort to create a surface Mars base, in preparation for the human Mars surface landing. With a well-equipped Phobos-station established, with an infirmary, emergency supplies, and a space-tug to recover any emergency MAV launch, no human base on Mars surface can consider itself isolated or precarious. Phobos crosses the sky over Cydonia every 7hrs and 39 minutes. In case of trouble on Mars, medical, logistical, or otherwise, the Phobos base can dispatch supplies, spare parts, and personnel in a few hours. In case of extreme emergency, the 3 man Cydonia landing party can get on board the MAV and be up on Phobos in a few hours. In the case of global dust storms on Mars, close radio contact can be maintained between Earth and the Mars surface base, via the Phobos-station, which will ride unperturbed above the clouds and radio-static.

Therefore, for orbital, logistical, and psychological reasons the Phobos base must be the strategic cornerstone of a human expedition to Mars. Human arrival at Mars begins with the establishment of a base on Phobos. This base will use well proven habitats tested on the ISS. Next in importance to Phobos will be the large booster family needed to get everything and everyone to Phobos and Mars' surface.



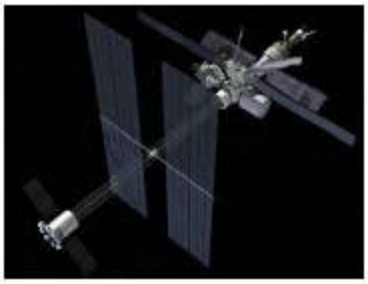
The relative sizes of Mars and the orbits of its two moons

The recent decision to create a heavy lift booster from shuttle components, termed here generically, the SLS (Space Launch System), has created a shift in thinking concerning both Lunar and Mars human expeditions and bases. In particular, the capabilities of this large booster have moved thinking back to many concepts and designs that originated in the Apollo era. In that era, the Apollo elements of Saturn V, CSM (Command Service Module) and LEM (Lunar Excursion Module) were viewed as proven starting points for an evolving family of vehicles to support continued exploration of the Moon and later, Mars.

The SLS shuttle derived heavy lift booster

The creation of a booster able to duplicate the Saturn V capabilities of

putting 120 tonnes (metric tons, 1000kg) into LEO and 47 tons into an escape trajectory will be augmented by a solar electric upper interplanetary stage to move 30 ton parcels to Mars.[1]



Solar Electric Propulsion Interplanetary stage for a Mars mission

Let us assume, then, that using the mission elements and components just discussed, the Phase I, intense and rapid mission to land humans on Mars and find evidence of a dead civilization at Cydonia Mensa and evidence of its nuclear demise, is successful. Once the effort is begun like Apollo, it can probably be accomplished in a decade. But what of Phase II? If the Phase I is successful and proves the working hypothesis of this book, how will we expand our bridgehead on Mars to make humanity an interplanetary spacefaring civilization? For this discussion we must turn to plans for a follow-on to Apollo, our first successful and rapid landing on another world.

We did it before, *we can do it again*. The very successful Apollo landings gave rise to concepts using the Saturn V and evolved Apollo elements that lend themselves to Mars planning and follow on activities

We learned how to land on another celestial body besides Earth, safely and rapidly, in a program stretching over several Presidential administrations, from Apollo. We also formed ideas about how to create a permanent base on another planetary body from post-Apollo planning. Everything we will do at Mars bears the mark of the Apollo program and its proposed follow-ons.

The Post Apollo Lunar operation plan was termed LESA (Lunar Exploration System- Apollo) and in its early stages used the Apollo CSM (command Service Module), and extended LEM (Lunar Excursion Module) capable carrying more payload to the Lunar surface and a LEM-derived Lunar habitat termed the LASS. These plans can help us on Mars.

Assuming that the Cydonian Hypothesis is proven and the human race moves to become spacefaring as rapidly as possible in a Phase II. This means a return to the Moon to occupy it also. This means exploiting Lunar and Mars resources to create an interplanetary civilization. If one is to adopt the useful strategy that Lunar and Martian occupation should be synergistic and architecture elements for Mars should be tested on the Moon, then the fuel systems for descent and ascent from both planetary surfaces should be the same. LOX-methane and LOX-kerosene are two systems of similar I_{sp} but with much different storage and synthesis requirements, that are under consideration for both Moon and Mars operations. Propane is another candidate.

The thermal environment on the Moon makes LOX kerosene the preferable Lunar fuel system because LOX Methane requires twice the refrigeration power for storage on the Lunar surface. However, LOX methane is presently favored for Mars because of Methane's ease of synthesis from the Martian atmosphere. However, Methane, while it gives slightly higher Isp than kerosene, 320seconds versus 300 seconds, requires more hydrogen to be carried to Mars, a non-trivial consideration for early missions. Synthesis of kerosene from the Martian atmosphere has been demonstrated but requires additional refining afterward. Therefore, it is possible that the down-select of methane, propane, or kerosene may be revisited in view of the ease of lunar operations with kerosene.

The Apollo era LOX hydrogen systems of the SLS will be adequate for lifting payloads to the Moon of the order of 30 tonnes. However for the

proposed 60 tonne landers from the Mars DRM (Design Reference Mission), because of their increased weight and increased delta-V required for Mars, higher Isp propulsion than chemical fuels will be required. Two proposed systems, either nuclear thermal at 900seconds, or Solar Electric at 1500 seconds, will be required for a TMI (Trans Mars Injection) which is 3km/sec above escape). A third option is to use the MET thruster using water as fuel at 900 seconds. It will be seen that the 60 tonne mass estimate for the Mars habitats appears driven by propulsion rather than crew size requirements and so can be changed.

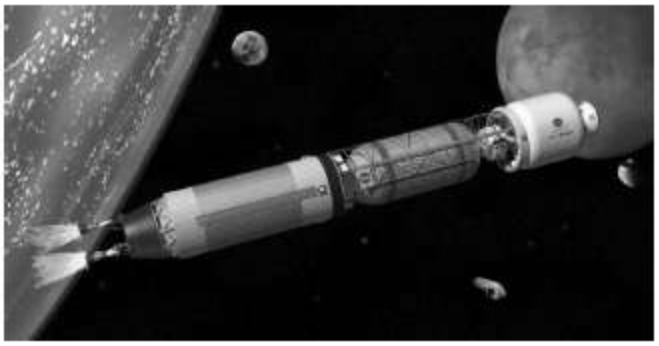
Drawing from the DRM the concept of 60 tonne landers for six people for a thousand day missions and the idea of similar habitats for both space and Mars surface habitation we can come up with a simple Moon-Mars architecture. We wish to use the MET thruster SEP system instead of the NTR (Nuclear Thermal Rocket). The problem with the MET SEP system is that it has much less power than the NTR system so that, even though the two systems have comparable Isp (900 seconds) the MET produces much lower thrust. This means delta V for escape from Earth's or Mars gravity is approximately doubled due to the necessity to "spiral-out" rather than doing a fast burn to get on an escape hyperbola.

This means we must cut masses and thus crew size. We also make use of the MET system's lower mass, and use the LOX hydrogen upper stage of the SLS, used for Lunar Injection, to boost the Mars payload to an escape trajectory and thus avoid spiral-out losses. We need 6km/sec delta V for a mission to Mars from LEO. It takes 3km/sec to achieve escape and an additional 3km/sec for TMI to Mars. We will assume we have a SLS derived 120 tons in LEO. The advantage of using a combination low Isp chemical and high Isp electric propulsion system for Mars is seen in that it uses the highest energy propellants, the electric part, at the fastest part and lowest gravity part of the journey.

With LOX hydrogen alone at 500 sec Isp (5km/sec exhaust velocity) we have the equation for payload into TMI in LEO. We must blast now out of low Earth orbit with chemicals because they are fast. Electric propulsion is a slow gentle push but chemicals provide a quick-hard shove that gets us out of the strong part of the gravity field quickly. If we tried to do this with electric

propulsion alone we would need to spiral out over months. The time spent in strong gravity means we are wasting energy fighting gravity when we should be out in deep space piling on speed to get us to Mars. This wastes fuel and energy just as a rocket hovering over the launch pad after liftoff wastes fuel. You need to clear the launch tower and get going, and get out of the gravity field as quickly as possible. Spiraling out from Earth also means spending a lot of time in the Van Allen Belts, which is hard on people and electronics and is therefore ill advised. So, we burn out of low Earth orbit with a chemical boost and then, when we are out of most of Earth's gravity and moving fast, we turn on the electric propulsion to build up speed to make a final escape from Earth and put us on a trajectory to Mars. Thus, combined chemical and electric is the safest most economical and most efficient means to get to Mars.

The attractiveness of NTR (Nuclear Thermal Rocket), which has no spiral-out losses, can be seen from a similar calculation where we assume I_{sp} =900 seconds. This lofts 60 ton payloads to Mars. Nuclear propulsion, with appropriate safety considerations, must be viewed as the inevitable goal if the human race is to be become truly spacefaring. First Fission and then Fusion nuclear energy will eventually drive human spacecraft. However, in the near term chemical and Solar Electric is the safest and cheapest way to establish a way to Mars and make it part of the human realm. That way goes through Phobos.



A Mars Mission powered by a Nuclear Thermal Rocket

Here, we briefly describe a more developed or Phase II system for placing

30 tonne packages on Phobos to establish Phobos-station in Mars orbit and the further phases leading to a Mars surface settlement. It must be remembered that the orbital velocity in low Mars orbit is 3.5km/sec whereas the orbital velocity at Phobos is 2km/sec. Escape velocity from Phobos orbit is 2.8km/sec, versus 5km/sec from Mars surface. Thus, Phobos-station is good to approach and leave Mars from, but not optimal in terms of access to and from the surface, where low Mars orbit is a better waypoint.

Phobos orbit is fairly high altitude, and a LMO rendezvous with an Earth return orbit stage may, therefore, be advantageous over an ascent to Phobos in Phase II. In later phases, a Mars settlement may be better supported by a low orbit Mars space station. Therefore, Phobos-station will serve more as a back-up base camp and rescue supply center in Phase I than a way station during the final surface landings.

With Phobos station established, however, Mars landing mission abort can be done to Phobos, with a return to Earth using Mars prepositioned fuel capsules in Mars orbit or at Phobos, and then returning the crew home to Earth. The Mars-Phobos system makes use of Lunar architecture capabilities using LOX hydrogen technology but also the MET high Isp (900seconds) system for the TMI and TEI (Trans Earth Injection) portion of the trajectories.[1] The high thrust chemical thrusters, either LOX kerosene at Mars or LOX Hydrogen at Earth are used for rapid boosts out of Mars or Earth gravity wells and then the MET is turned on for the escape trajectory to supply additional delta V for interplanetary travel.

First, we reduce the crew size to 3 rather than 6 and adopt a 30tonnes habitats and MFP/MAVs. (Mars Fuel Plant)/(Mars Ascent Vehicle) We further assume the existence of a SLS vehicle which puts 120 tonnes into LEO whose LOX hydrogen third stage can put 50 tonnes on either a lunar or escape trajectory from Earth. The twenty tonne margin is then available for Lunar operations to land the habitat on the Lunar surface or for TMI propulsion. Occupation of the Moon is envisioned as an inevitable consequence of confirmation of a dead civilization on Mars and the requirement for Mars settlement and the establishment of space logistics infrastructure.

The habitats are tested on the space station and two MFP/MAVs are sent to

Mars to test them, first on Phobos and then on the surface. The MFP/MAVs make LOX kerosene fuel and water and put two CEV-mass capsules into Mars orbit to demonstrate end-to-end the MFP/MAV system in the Martian environment. Mars dust may prove itself ingenious in disrupting so called “foolproof” technology tested at Earth. In any case, the Mars descent and ascent vehicles and fueling with ISRU, must be “man-rated” at Mars. The capsules, rather than carrying people from Mars surface to low Mars orbit, will carry LOX kerosene fuel and water for the return trip from Mars and also for stockpiles at Phobos. In this way, man-rating of the Mars surface to Mars orbit propulsion will be thoroughly tested and used to position contingency supplies of fuel in Mars orbit.

The 30 tonne MFP/MAV is boosted to Mars by first being part of the 50 tonne payload put on an escape trajectory to Mars by the SLS third stage. Once on an escape trajectory, the Mars MET-TMI package unfolds 500kw solar panels and burns 10 tonnes of water in a cluster of 10 -50 kW METs. These burn for eighteen days to put the spacecraft on a Hohman transfer orbit to Mars. Once at Mars the vehicle burns its MET engines to inject into Mars orbit and aero-brakes into low Mars orbit. From low Mars orbit the vehicle can drop a 30 tonne habitat to the Mars surface or rendezvous with an orbiting Mars fuel and water capsules, orbited earlier to test the Mars surface systems, to obtain fuel for the Earth Return burn. A Mars surface habitat also serves as the crew habitat during the TMI orbit and remains in orbit around Mars when they descend to the surface. For crew decent to the surface after the interplanetary stage is fully fueled in Mars orbit, the crew descends in standard CEV to the surface via retro rocket and parachute. When the stay on the surface is done, the crew boards the MAV and lifts off Mars surface and has a rendezvous with the orbiting interplanetary stage habitat and burns LOX kerosene to escape from Mars orbit, where it turns on the MET again to burn water to achieve TEI delta V. This summarizes the system

The thirty tonne mass range for packages to and from Mars using mixed LOX hydrogen and MET thruster, meshes well with LOX hydrogen upper stage SLS capability to place 30 tonne LESA-LASS type packages on the Lunar surface. Thus the new Moon-Mars architecture can be viewed as a continuation with new propulsion technology of the Apollo legacy.

Once a Mars surface base is established, every attempt should be made to establish a colony around it, with the base rapidly reaching self-sufficiency in food, water, and building materials. The basic supply run payload to Mars will then become people. The Phobos-station, so useful in the early days of Mars exploration, will then be supplanted to some extent by a low Mars orbit space station as Earth-Mars transit hub. Phobos-Station, given its high orbital position will transition to supporting an asteroid belt human mission to Ceres and other major bodies in the asteroid belt.

Nuclear thermal or nuclear electric propulsion will supplant the SEP-MET. In time, however, water, being very abundant at Mars, and giving good Isp, may become the primary propellant for interplanetary travel using a nuclear electric-MET system.

The establishment of a human presence at Mars, when done optimally, and with an eye to the necessity of political support being maintained over several successive Presidential administrations, is best done using Phobos as base-camp and staging area in the Mars system. Extensive use of Mars ISRU systems to support Mars surface to low Mars orbit transportation and Solar-electric propulsion.[2]

Addition of an early Phobos-station to the Mars mission planning “tool-box” brings many advantages, and should become part of the Design Reference Mars Mission. As for transportation, the thirty tonne mass range for packages to and from Mars using mixed LOX hydrogen and MET thruster, meshes well with LOX hydrogen upper stage SLS capability to place 30 tonne LESA-LASS type packages on the Lunar surface. Thus the new Moon-Mars architecture can be viewed as a continuation with new propulsion technology of the Apollo legacy. The use of LOX-kerosene ISRU based propulsion on the Mars surface for Mars ascent propulsion, may offer many advantages over LOX methane, the most important of which being that kerosene needs less hydrogen to make. Lunar designed habitats may also be useful for the Mars Phobos-station, and, with modification, the Martian surface. Thus, with a reduction of basic crew size, and use of a solar-electric MET interplanetary stage, lunar habitats can be sent to Phobos and a Mars mission begun with much less resources than a direct attempt to land and sustain humans on Mars.

In general, the use of Phobos as a base camp and initial beachhead in the Mars system confers many advantages to a Mars mission strategy, not the least of which is to provide an ‘early significant accomplishment’ of a Mars program and the establishment of an easily sustainable foothold in the Mars system. It will also provide vital psychological support for any landing team. Phobos is easy to get to and easy to return from, being relatively high in Mars gravity potential well. It is the ideal base-camp and staging area for establishment of a Mars surface base in preparation for human occupation. The Phobos-station, combined with a Saturn V class booster, ISRU at Mars and Solar-MET propulsion, makes the entire Mars surface landing something that can be done cheaply and safely over an extended period. This also appears to be a program that could enjoy political support over successive administrations.

Such a Phase II Mars program has considerable synergism with a Lunar base program using the same large Saturn V class booster, and Lunar habitats, and in its early phases, the base on Phobos. The use of Solar-Electric MET propulsion avoids the controversies of nuclear power in any orbit near or approaching Earth. The use of Martian ISRU for the main tasks of supporting the colony in Phase II and lifting astronauts and fuel packages off Mars to low Mars orbit for a Mars orbit rendezvous with a Mars-Earth interplanetary stage makes this problem far more solvable than doing direct to Earth launch from the Mars surface.

This program, the author believes, will forever change human destiny. However, we must return to the problem of psychological crew stress in the earlier, heroic, Phase I.

The psychological aspects of exploring the site of a possible massacre cannot be under emphasized. It is for this reason that “Conquering Fear (Phobos)”, establishing a forward human base on Phobos, is important from the outset. It shows the public the human race has achieved a beachhead in the Mars system and that we are there to stay. It flies over the landing party at Cydonia and maintains continual radio contact with them, with supplies, medical help, weather forecasts, and helpful advice just a few hours away or less. This will help the early landing crew and even later settlers deal with the trauma of possibly encountering mass death and ruins where ever they dig.

Cydonia and other areas on Mars will be similar to other archeological sites where evidence of mass death and massacres is encountered.

Mohenjo-daro in Pakistan from the name "mound of the dead" in the local language

Unburied Bodies. Evidence of a massacre at Mohenjo-daro several millennia ago

Bodies recovered at Pompeii, where a volcanic eruption destroyed a Roman city in minutes. The possibility of uncovering a massacre at Cydonia and its psychological effect on the first astronauts cannot be dismissed

Even with the reassuring presence of the Phobos base, which should be called “Base Courage” to signify its conquest of fear, the initial lander crew at Cydonia Mensa should be composed of male combat veterans, all of whom have fathered children. They should be chosen for their physical and psychological toughness and commitment to the mission to safeguard their country and all of humanity. They should be armed; henceforth, humans do not go anywhere in the cosmos except they are armed. Great honor should be accorded these men in the initial landing crew when they, after many years, return to Earth. The base at Cydonia Mensa should be named “Base Resolution” because by it, and its brave first occupants, will the Mars Crisis be resolved and humanities’ future be secured.

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Epilogue: Face to Face

"When I was a child, I spoke as a child, I understood as child, but when I became a man, I put away childish things. For now we see through a glass darkly, but then face to face. Now I know in part, but then shall I know, even as I am known. And now abideth faith, hope and love, but the greatest of these is love."

Apostle Paul, *I Cor.* 13: 11-13

"No, we are not in Kansas anymore. But the truth is that Kansas was always stuck in the middle of Oz, just a small island of the familiar in a sea of strangeness…"

President Taylor, in his televised address to the people,

Morningstar Pass, The Collapse of the UFO Coverup

"Landing on Mars is essential to future human survival"

Gen. Eric Bolden U.S. Marines (Ret.) former Astronaut and Shuttle Pilot, NASA Director April 25 2014

In the dream, I was with my children in a campground near a highway in a desert wilderness. It was a beautiful blue-sky day. I looked from them to a vast, sprawling Air Force Base in the desert distances. Suddenly, the portion of the base nearest me blossomed into a nuclear fireball. Then, distant portions of the base also were struck by nuclear weapons and I realized that a total nuclear war had started. As I looked past my children to the horizon where I knew major cities lay, I could see white mushroom clouds rising into the blue sky. I knew then that the world was being destroyed as I watched. And I knew it was now too late to even pray. I then awoke. One cannot stare long into the abyss that is Mars without being affected. The nightmares of my

youth had returned.

Naturally, I have wondered from time to time, if my perception of the Mars data is not colored by my life experience on this tragic sphere of Earth. Part of me has always hoped that we would find the stars and their inhabitants better and more noble things than those of this world. But as a scientist I know that the Earth appears as a beautiful blue star to distant observers, and that we and stars are part of the same physical system. This fact ensures that the stars, and those who dwell in them, will know disaster and misery as surely as this world does. Therefore, I return to staring at Cydone, and the desolate world on which it sits, and, at length, arrive at same conclusions as before. Thus, ***'I calls them as I sees them,'*** and as a scientist dedicated to serving my country and humanity, I must report that which I have found.

In the mid 90's Sandia National Laboratories came under new management, and is now administered by the Lockheed Martin, with a much different management style. Sandia continues its work to harness thermonuclear fusion in controlled micro-explosions. Most recently it has been investigating the Wells- CMTX approach that I helped to revive.

Roberto and his brother, the Nicaraguan refugees sponsored out of detention by my lovely then-wife, were, thanks to her tireless efforts after returning to Albuquerque, finally granted permanent asylum in Canada. Given the passions and violence of the times, my then-wife's efforts probably saved their lives.

Our daughter Elizabeth grew up and married and has made us grandparents. I married again and had more children.

The Cold War ended without a single nuclear weapon being used in combat. Hopefully, this lesson will not be lost on the leaders of the nuclear powers in the New Millennium.

My GEM unification theory advanced, giving me great consolation as a scientist. I was finally able to predict not only "G" but also the proton, charged pion and W particle masses from the Planckian Vacuum in a few lines, and finally the Higgs mass as 137 times the mass of the proton, or 128GeV. This, 4 months before it was announced.[1]

Robert Zubrin made a human Mars mission economically feasible by his

proposal to use Mars resources in 1997.[2]

A sailor Moon anime' character named Galaxia in the 90's, was possessed by the spirit of Chaos, and became Galaxia Chaos.

Captain Outerbridge, the bold and decisive commander who fired the first shots of the American military in World War II, several hours before the attack on Pearl Harbor, was rotated back to desk duty in Washington until June 1944 when he was given command of the destroyer **O'Brien.** He commanded this ship as it gave fire support to Allied landing forces on the morning of D-Day and the subsequent campaign to capture the port of Cherbourg. He was then sent to the Pacific where he commanded a destroyer in heavy combat through the rest of the war. He continued a long and distinguished career in the US Navy, through the Cold War. He died in 1986. The wreck of the midget submarine he sank was finally found in August 2002 in 1,300 feet of water near the mouth of Pearl Harbor.

On May 3, 2003 the "Old Man of the Mountain", fell off the mountain in New Hampshire, a victim of the same geologic forces that created it. Nothing lasts forever, not the stars, not this moment in human history.

This story draws to a close. Now even the stars seem to shine more coldly on us. How did we get so far from Kansas? That is, from the old comfortable cosmos that we used to live in, a cosmos we could simply ignore if we wished? It is dead, it has died on Mars at Cydonia and Galaxias. The death on Mars is of our innocence regarding the Cosmos.

Basically we have come to this place because we became interested from ancient times in our nearest neighbor in space because of its color and wide variation of brightness and position in the sky. Mars' color and movement made it seem important among the planets and associated it with war and bloodshed, serious matters on Earth. Later, Mars' obviously elliptical orbit made it the spark of the Scientific Revolution. Still later, its polar caps, clear atmosphere, and mottled features provoked comparisons to Earth and its biosphere. Finally, spacecraft revealed on Mars a past that was Earthlike and signs of archeology. A horde of scientists and engineers defied the so-called Mars experts and investigated these signs of archeology and placed them in the context of the rest of the Mars data.

Now we have found that Mars, based on its Earthlike past, and based on images of objects at several locations, was in fact the home of a civilization that appears to have been primitive and indigenous, and appears to have perished tragically with the collapse of Mars' Earth-like climate system. The evidence of the mass spectrum of isotopes in its atmosphere, and their distribution on its surface indicates that Mars was most likely the victim of nuclear genocide on a planetary scale by some other spacefaring race. This is all only a working hypothesis, but it is the scenario that best fits the data we have available. This all tells us that Mediocrity, the idea that Earth and humanity are unremarkable in the cosmos, is a good rule of thumb for the universe. It also appears to tell us that in a cosmos already known to be dangerous, the worst enemy of intelligent life is apparently other intelligent life.

The author has urged that humanity respond to this discovery by launching a human mission to Mars effort as soon as possible to maximize our knowledge of what transpired on Mars and how we can prevent it from happening here.

Now, the whole story of life and death on Mars is fairly clear. Mars and Earth both became the abode of life from their earliest days. Mars, however, needed a massive Venusian greenhouse to have an Earthlike environment and liquid ocean. A Martian Gaia formed, making oxygen and an ozone layer, making it even more attractive to life. A massive and evolving biosphere was present on Mars. Then, as on Earth, that ultimate adaption of life to its environment, intelligence, appeared. The biosphere produced an intelligent humanoid species who built great stone faces and pyramids. Then, in what appears to be a deliberately staged holocaust, another group of more advanced ETs arrived and destroyed Mars by a combination of steering a large asteroid into Mars to form the Lyot impact basin near Cydonia and following up this devastating impact with two large nuclear weapons to ensure that the extinction of intelligent life on Mars was total and that Mars would never recover. This proposed scenario explains the strange geographic correlation of the large asteroid impact with the centers of the nuclear explosions. The motivation of the advanced ET group may have been elimination of the Martian culture as future competition in a later epoch. These events happened approximately ½ billion years ago.

The reader will perhaps forgive the author if he tries to find a deeper meaning in the tragedy we have discovered on Mars. In the author's recent book ***Cosmic Jesus*** a metaphysical analysis of the Bible indicated the birth of Christ was a cosmic event and not just of consequence to Earth and its people. It should be known, that the grim findings on Mars and the mental revulsion it evoked, provoked this author to meditate on cosmic good. Thus, the metaphysical book ***Cosmic Jesus*** was reaction to the scenario discussed in this Mars book. Consistent with the curious findings discussed in ***Cosmic Jesus,*** this Solar system may have been prophesied to be the home of the Christ by other species in space, and perhaps became a target because of it.

The Face in Cydonia from Mars Odyssey

New Image of the D&M Pyramid

Face image from Mars Odyssey from Galaxias Chaos

To that end, the author speculates that the holocaust inflicted on Mars was motivated, like Herod's slaughter of the innocent in Bethlehem, as an attempt to prevent the birth of Christ in this solar system. The author admits freely that this is an emotional conjecture; perhaps a balm on a mind wounded at the contemplation of such tragedy and raw evil as seems evident on Mars. But all of us are moved in the presence of great tragedy to find larger meaning in it. Finding meaning in terrible events is often what enables people to survive them. For me, writing a book about Jesus was the best way I could end the nuclear war nightmares that troubled me, and the sadness that threatened to overwhelm me, after completing the Mars research I have described here. Certainly the destruction of Mars and its people should not be considered the act of purely rational beings, but instead being motived by fear and hatred. We know such things and actions exist because we have seen them on Earth.

The new images and new data from both Mars probes, landers and meteorites, are all consistent with the New Mars Synthesis, that Mars was Earthlike in every way, for most of its geologic history. The new imaging data from Cydonia and Galaxias thus confirm the Cydonian Hypothesis. Mars apparently lived like the Earth now lives, and, like Earth, became the home of a humanoid civilization.

While it cannot be proven that Cydonia, the sign of possible life in Mars' past, did indeed save Mars science from oblivion after the failed Viking life experiments, it can also be argued that without the work of Dipietro and Molenaar, and the IMIT, the crucial discovery of Mars Meteorites would not

have been made. Without a picture of an Earthlike Mars, with rain and a water table to implant atmospheric gases into the Mars rocks, the crucial connection of Mars atmospheric isotopes to the gases trapped in the Mars meteorites could not have been made scientifically. Without the Face on Mars, the Mars Meteorites could still be sitting in museums, labeled as merely “anomalous achrondrites” and Mars would be of as little interest as barren Mercury. However, it is now Mars that is the focal point for human space endeavors. As for the author, it is a perverse delight to be “he-who-must-not-be-cited” on Mars.

Since the Viking took the image of the Face in Cydonia on Mars, we have obtained a new Heaven and a new Earth. The number of exo-solar planets is now in the thousands and the Cosmos is now known to be awash in the stuff of life: water and organics. Life on Earth is now known to have begun very early, almost as soon as an ocean formed on its surface. This indicates life is both a probable and natural occurrence on any planet whose surface conditions are similar to conditions now known to be shared by both early Mars and Earth. We now live on an Earth that from its earliest period, was part of a living cosmos. Mars, as well, is now being confirmed as part of that living cosmos. The dark visage of Cydonia, whether acknowledged or not, has been the secret driver of this new knowledge, a Rosetta stone.

The confirmation of the Cydonian Hypothesis and the New Mars Synthesis requires a response as massive as the scope of this discovery. An international human mission to Mars is now urgent and mandatory. We must become spacefaring, and we must maximize both our knowledge of how Mars lived and died, and only a human occupation of Mars will accomplish this. Unfortunately, JPL, despite its brilliant technical talent, must be relieved of any oversight of further investigation of Mars, having shown itself incapable of handling this grave responsibility to the human race. Robotic precursors to the international human Mars mission must be overseen by a different institution. This is a tragic aspect of this Cydonian discovery but there is a much larger one.

A Mars that is the site of planetary scale nuclear massacre is sadly at home in the cosmos that is silent as a cemetery. The cosmos, based on finding life on both early Mars and early Earth, and the multitude of planets found

around other stars, should be bursting with life and its radio broadcasts, but it is silent. Is the answer to this paradox on Mars? Is the nature of the cosmos a savage jungle, where the truly intelligent keep silent and camouflage themselves?

The Cydonian Hypothesis and New Mars Synthesis require a long-lived biosphere on Mars and also its sudden death, given Mars present state. We must maximize knowledge of how and why Mars died, apparently a humanoid civilization dying with it. We must rapidly become a spacefaring species in a cosmos where both life and death are part of its fabric to ensure that Earth and humanity do not emulate Mars' fate. The means to achieve both ends is to launch an immediate effort to place an international team on Mars as soon as possible. This task, though difficult, is well within our abilities. We can do this task.

The astronauts who will be sent to Cydonia on Mars to uncover the civilization buried there must be carefully chosen and supported with a high level of logistical and psychological support. These people are being sent to what appears to be the site of a massacre. They must be carefully screened psychologically and supported with lavish prepositioned supplies on the Mars surface and by a "base camp" on the moon Phobos. The landing team must be prepared to spend several years on Mars before a two-way transportation infrastructure can be put in place. They must unearth the artifacts and probably bodies remaining from the civilization and send samples up to Phobos and whence back to Earth. Thus will we ensure, as far as humanly possible, that Earth will not share Mars' fate.

The journey to this scientific crossroads in human history has been long and fraught with drama and revelations. The heroes of this effort are a vast number of scientists, engineers and curious lay people, that refused to simply dismiss what appeared to be signs of archeology, but instead investigated and reported their findings.

Chief among the heroes of this effort, ironically, must be named the US government itself. Apparently forearmed with the image of the Lowellian Mars, the US government fully expected to find a dead civilization on Mars, as suggested by the Brookings Report. After some early disappointments, it finally began to see, investigate and report data, beginning with Mariner 9, of

suspicious objects on the surface, as well as expected signs of an Earth-like climate in a past epoch. Finally the discoveries in Cydonia Mensa first publicized by NASA itself and with data duly recorded and made available to the public, allowed investigators to delve deeply into the whole mystery of Mars. If an actual government cover-up had been in place, no such data would have been made available, nor would the scientists and engineers investigating, many of whom worked in the defense and aerospace industries, have been allowed to finish their work. A simple ‘tap on the shoulder’ by some ‘G-Men,’ would have been sufficient to convince most of them to set the matter aside. Instead, it must be concluded that, on the whole, the US government has simply monitored the progress of such investigations and left them otherwise alone. It was content to let the normal process of scientific inquiry, complete with its battles, run its course. There remains the petty attempts at obstruction by JPL and MSSS, but these seem in retrospect to merely be part of a clumsy, and in the end, futile effort to misdirect attention rather than cover-up actual Mars data. That unfortunate effort seems to have been done in defiance of NASA headquarters directives and to be driven by institutional dogmas and “human vs robotic” tensions present within the space exploration enterprise. However, the reasons the US government would seek, passively at least, to have created conditions for the discovery of a dead civilization on Mars and the apparent chilling circumstances of its death, are worth discussion.

The motivations of the US government in allowing this great and terrible discovery to come to light appears to be simply that all governments, if they are to survive and serve the interests of their people, must ultimately acknowledge cosmic realities and deal with them openly. Realities one nation ignores, other nations will exploit.

The ultimate tool of a democratic government is the trust of its people. It must be preserved. This trust is a democratic government’s ultimate resource in times of peril. Trust cannot be preserved if a government tries to hide reality from its people while at the same time investigating it. In such a case of trying to hide the truth, either investigation or public trust must ultimately be sacrificed. In the case of Mars, investigation has been made in good faith, and the truth has been laid bare for all to see, as this tome attests.

Therefore, as was discovered by Donald Ecker in the Brookings Report, the US government recognized that Mars might hold this secret from the beginning of the Space Age -apparently because of the work of Lowell. The US Government also recognized, being funded through democratic processes, that finding such a civilization would have to become public knowledge. Any human missions to Mars to explore a dead civilization would be such a massive undertaking it would have to be publicly justified as such. That exploring any dead civilization on Mars, once discovered, would be viewed as essential to future human survival, was also accepted as obvious.

The government was also aware, from the beginning of the Space Age, that many scientists scoffed at the theories of Lowell, and later at the theories of the Cydonia investigators. However, this meant little to government officials, especially the military. Governments deal in risks, not probabilities, and they fear being "blindsided" more than any other event. Governments have also long held the opinions of scientists in far less awe than the public, being more familiar with science and its foibles. The government, for instance, has a vivid collective memory of supposed 'scientific impossibilities', like space travel and nuclear energy, suddenly appearing before them as cold facts. Therefore, the government collectively knew that ***'Mars science is too important to left to Mars scientists,'*** and acted accordingly, pursuing evidence of a dead civilization and allowing others to do likewise. As a result, the government itself pushed the further exploration of Mars knowing full well that the expanding data set might well reveal what has been found. The government, in this case NASA, also put its full backing behind the announcement that signs of microscopic Mars life were present in the Mars meteorites. The furious opposition to this announcement and attempts to disprove it, came not from within the government but from various scientists and independent institutions. In the end, the NASA team that made the initial discovery stuck doggedly to their hypothesis and both defended and broadened it vigorously.

In the author's opinion, and based on his own research on the CI meteorites, the McKay-Gibson team has proven its case for life signs in Mars meteorites. This result supports the Cydonian Hypothesis. Thus, the Second Copernican Revolution, the realization that humanity is not alone, has begun. And this was not the result of government employees covering up evidence

of life on another planet, but instead doing their jobs superbly.

In summary, the Mars-Cydonia Investigations would not have existed without the efforts of the US government to vigorously explore Mars and make public the data gathered there. In this whole effort several individuals also deserve special recognition.

The list of heroic persons of the Cydonia-Mars investigations is long and stretches back to the original Viking expedition, led by Bruce Murray. Tobias Owen deserves credit for calling attention to the original face image in frame 35A72 on July 25 1976, as does Hal Masursky for deciding to make it public. Walter Hain of Germany investigated it shortly thereafter as did Vladimir Avinsky of Russia, and both generated public interest.

Vincent DiPietro and Gregory Molenaar probably did more to advance the investigation of Cydonia than any early investigators because of their careful technical work on digital imaging and their finding of the second image of the face on 70A13. Their careful work and sober presentation of it at scientific forums created a groundswell of interest in the scientific community and triggered the interest of both the author and of Richard Hoagland, who organized the IMIT (Independent Mars Investigation Team.) The work of the IMIT validated and expanded on the work of DiPietro and Molenaar and culminated in a seminal presentation of its findings at the Case for Mars II meeting in Boulder Colorado in July 1984. It can be said that Hoagland subsequently made the Face in Cydonia as well known as the face of George Washington on the dollar bill.

Mark Carlotto began to be active in the Mars investigations shortly after the IMIT work wrapped up. More than anyone besides DiPietro and Molenaar, he advanced the science of Cydonia image analysis with his “shape from shading” reconstructions of the face and his careful analysis of possible teeth and helmet ornaments on the face. He was also helped by the late Brian O’Leary in these studies. Donald Ecker discovered the Brookings Report.

Stanley McDaniel, surveying the dissembling behavior of JPL in the face of what might be the scientific discovery of the age, wrote his crucial “McDaniel Report” in 1993 which alerted academia to the possible

miscarriage of science taking place on Mars. Academia responded by demanding the NASA investigate. With Horace Crater, of the University of Tennessee Space Institute, Stan formed the SPSR (Society for Planetary SETI Research) which became the important scientific group bringing together Cydonia researchers and this all led to the reimaging of Cydonia by JPL in 1998.

Carl Sagan deserves special credit in this investigation, also, because of his interest and helpful criticisms of the Cydonia investigations and especially his final deathbed endorsement of the reimaging of Cydonia. This endorsement may have tipped the balance within the councils of NASA that Cydonia should be reimaged. Dan Goldin, then Administrator of NASA, deserves special credit, also, for forcing JPL to carry out the reimaging and then mandating that further images be taken.

In general, it can be said that despite some predictable scientific controversy, the scientific process functioned fairly well in the Cydonia investigation. The discovery image provoked interest, and further investigation, even a decision to reimage the site during the Viking mission. This data was investigated along with the other lower resolution images from Viking. This led to a scientific dispute, that could only be settled by more images, thus provoking further probes of Mars. The new images and data have been obtained and confirm the hypotheses offered in favor of archeology.

It must be emphasized that the Cydonia investigation has had a profound influence on mainstream Mars science by proposing an Earthlike Mars for a long period of geologic history. The paleo-ocean of Mars was first discussed in the IMIT paper at the crucial Case for Mars II conference, as was a Mars with an Earth-like climate and hydro-cycle. Not only did the Mars ocean become adopted by the Mars community as a whole, but the Earth-like Mars hydro-cycle concept was essential to explaining how Mars' atmospheric gases could be implanted in Mars meteorites and thus the recognition that these meteorites had a Martian origin. This discovery, in turn, led to the discovery of Mars microfossils in ALH84001. Thus, The Cydonia investigation, despite its popular image as a radical fringe of Mars science, was in fact a driver of Mars science in the mainstream. However, these are

merely academic considerations now; we have instead of a scientific inquiry, a looming Mars crisis.

The Mars crisis looms because the circumstances of finding a dead civilization on Mars have profound implications for long term human survival in the cosmos and require actions of humanity that are at the limits of its present capabilities. This is no longer a simple scientific inquiry; it now involves possible threats to long term human survival. In the silent cemetery that is the local universe, the human race has staged a “rock concert”; in the darkling plain that is this cosmos, we have lit a large bonfire and danced around it. The radio and television broadcasts of the human race, plus the ever-present hum of our power grids, with effective antennas stretching thousands of kilometers, and the gamma ray and electromagnetic pulse signatures of our high altitude nuclear tests, have all raced out into the silent stars. These emanations have alerted whoever is watching that we exist and have achieved a modest level of technology. We cannot call back this ever expanding sphere of electromagnetic noise, what is done is done. We must instead deal with its possible consequences. One possible consequence may lie on Mars.

To summarize: we have found what appears to be a dead civilization dating from a past epoch of Earth-like conditions on Mars. The data consists of multiple images depicting what appears to be detailed but eroded archeology, with large scale alignments present among objects, as is found on Earth. The eroded remnants of this civilization have been found at several sites on Mars, but none of the sites shows any roads or layout of ruins that can be associated with an advanced civilization. The civilization appears to have depicted humanoid faces, suggesting it was humanoid in form. Thus, the hypothesis that this civilization was primitive and indigenous appears most consistent with the whole of the Mars data base, plus the concept of Mediocrity, the concept that Earth and humanity are not exotic developments in the cosmos, but part of a general cosmic phenomenon. A large asteroid impact landed near the apparent center of this civilization, of a size to have disrupted Mars climate severely and caused mass extinction of Mars life.

Separately, we have found a pattern of nuclear isotopes in the atmosphere of Mars and distributed on the planet’s surface, both from space probes and

Mars meteorites, that is consistent with two massive nuclear explosions involving fission driven by high energy fusion neutrons. These explosions occurred in the air and apparently irradiated large portions of Mars surface with neutrons, with localized intense neutron radiation and radial scattering of radioactive surface debris across the entire planet's surface. The centers of these explosions appear correlated with the asteroid impact and the two most identifiable sites of the civilization.

Therefore, based on the whole of the Mars data set, from landers and rovers, orbital probes, meteorites, and Earth-based telescopes the author has concluded that two independent lines of evidence point to massive intelligent activity in Mars past. One line of evidence is from nuclear physics, and indicates intelligent activity of the worst kind: nuclear genocide on a planetary scale, a phenomenon known only on a minor scale from our own history. The other line of evidence indicating intelligent activity on Mars in the past, from geochemistry and imaging, shows the apparent target of this nuclear attack, an apparently primitive, indigenous, humanoid civilization. This would all be merely saddening if it occurred in a noisy, friendly, universe where humanity had been welcomed into a community of intelligent peoples, long established and respectful, but our discovery on Mars has not been found in this context.

This grim discovery on Mars, likened to finding a corpse in ones' backyard-bearing multiple stab wounds, has been found in a universe that is as silent and forbidding as a ghost-town, yet where apparently every star has planets. Therefore, Fermi's Paradox could not be more acute and ominous in the cosmos we are finding around us. Therefore, a Mars crisis looms and we must rise to its requirements.

Mars Crisis, in the Chinese pictogram system: 火星 危机, is indicated by the first symbols "fire star" and the two last symbols meaning "danger" and "opportunity." That exactly summarizes humanity's situation now: on the one hand we may have endangered ourselves by fundamentally misjudging the character of the cosmos we dwell in, but on the other hand we have shown ourselves incredibly lucky by finding out a terrible truth about the cosmos by seeing it happen to someone else- and being fully capable of reacting to this knowledge so as to prevent this terrible truth from happening to ourselves.

We have the whole universe before us, and we have space ships and weapons to deal with the universe the way it is. They may be feeble now, but with hard work and vigorous actions they will become mighty in the future. Therefore, at Mars, the cosmos has thrown down a steel gauntlet to humanity, and we will pick it up. There is no other way.

Some might suggest we will never be equal to the universe that confronts us, that we should return to the wild and live as primitives again, without electricity, without fire, without anything. They will suggest we should shrink back from the stars and the moons of Mars, Fear and Terror, and hide ourselves in caves. That such an approach will condemn most of the human race to death and poverty when the technologies of agriculture and materials are given up, is a detail that they will not mention. Such opinions are already part of the radical fringe of the environmental movement, but this author rejects them utterly. No, that is not what this discovery on Mars means for humanity.

To the author, the road to the future is as clear and vast as the stars of the heavens. It is the road of power and courage, invention and exploration. We must boldly go where we have never gone before.

Landing on Mars: The future triumph of the human race

We are now like Abraham lamenting to God at night in his tent, that his wife was barren and that his prospects in the Promised Land looked grim. But God spoke to Abraham and led him outside under the stars, and said to him:

“Behold the heavens and count the stars–if indeed you can count them.” Then God said to Abraham, “So shall your seed be.” (Gen.15:5)

With God’s help, we are going the make that verse a reality.

This is the author’s vision for humanity: Humanity, led by the United States, is going to rouse itself instantly and charge up to Mars, conquer Fear and Terror and make them into space bases, discover what happened on Mars and prepare vigorously for whatever the universe throws at us. Be we a venomous Puffer Fish, or be we a Federation Star Fleet -when and if someone shows up to do a ‘Mars-repeat’ in this solar system, they will find the human race “not worth the trouble…”

Mars is the gateway to the stars. We are going out to settle and fortify what was the ghost town around us. The universe may be a tough place, but we are its legitimate children and we come from a tough town ourselves. Therefore, we will be found equal to the challenge of the cosmos. We will increase in strength and size and skill every year. We will not just survive in the universe, we will thrive. That will be our reaction to what has been found on Mars, and our true memorial to its previous inhabitants.

“So shall your seed be…”

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Appendix
Fission Yield Calculations

Based on the observed abundances of Mars Xe and Kr isotopes and the observed enriched layer of U and Thorium on its surface, it is possible to estimate the number of fissions that occurred under this hypothesis and thus the energy release and approximate size of the original device fissionable casing.

Based on the abundance of ^{129}Xe in the Mars atmosphere and assuming it was all produced in the explosion at approximately a fraction mass yield F_{129} into the atomic mass 129 channel of F_{129}=3% for a fast neutron spectrum we can write for the total energy released based on ^{129}Xe:

$$W_{Xe} = W_{fission} n_{Xe129} HA / F_{129} \cong 1.5x10^{26} J \qquad (1)$$

where $W_{fission}$ is the energy released per fission of 200Mev or 3.2x 10^{-11}J, n_{Xe129} =9x10^{10} cm^{-3} is the number density of ^{129}Xe in the Mars atmosphere, H =1.1 x 10^{6} cm, is the Martian atmosphere scale height-giving a columnar density of 10^{17} cm^{-2} or 3x10^{18} fissions per cm^2 of planetary surface- and A is the surface area of Mars of 1.4 x $10^{18}cm^2$. This is a large energy, equivalent to the impact of a 70km diameter asteroid into Mars and sufficient to produce a global ejecta layer of 4meters. 1 Megaton of energy is approximately 4x10^{15} J so an energy release of 10^{26}J is 10 billion megatons.

Based on the neutron fluence $F_{neutron}$ = $10^{14}/cm^2$ neutron fluence required to explain the irradiation of lithogies B, C of EETA79001 and account for the ^{80}Kr anomaly, and assuming this was a planet-wide occurrence from delayed neutrons of an approximate fraction $F_{delayed}$ = 0.01% that were radiated immediately after the event by fission fragments in the planet-wide ejecta layer, we can calculate and approximate number of fissions in the event as

approximately 10^{18} fissions per cm^2 of planetary surface and thus have an independent estimate of the yield. We can then estimate the yield from the ^{80}Kr anomaly:

$$W_{Kr} = W_{fission} F_{neutron} A / F_{delayed} \cong 4.6x10^{25} J \qquad (2)$$

where the values of other quantities $W_{fission}$ and A are the same as in Eq. 1.

Assuming a thickness L=1 meter layer of Th and U of concentration C = 1 ppm of a total molecular number density of $n=6x10^{22}$ cm^3 covering the planet's surface, this gives a columnar density of $6x10^{16}$ cm^{-2} or $6x10^{17}$ fissions per cm^2 of planetary surface- assuming $F_{fissionable}$ = 90% casing burnup. This would

represent an original amount of $9x10^{35}$ atoms of uranium/thorium or approximately 10^{12} moles at 238g per mole. At $19g/cm^3$ this represents approximately 10^{13} cm^3 or 10^7 m^3 or a cube roughly 200 meters on a side. Again we can again estimate the total energy yield:

$$W_{U-Th} = W_{fission} F_{fissionable} CnAL \cong 3x10^{24} J \qquad (3)$$

The explosion would have been a planetary scale catastrophe. The appearance of a region of enhanced Th and radioactive K is not reflected in maps of shorter lived Fe and Si isotopes and indicates the event occurred several million years ago and probably dates to the middle or late Amazonian epochs. Irradiation of lithogies in ETA79001 indicate a possible 180 million year age for the event. Taken together, the estimated yields of the explosion are all approximately 10^{25} J or on the order of 1 Billion megatons.

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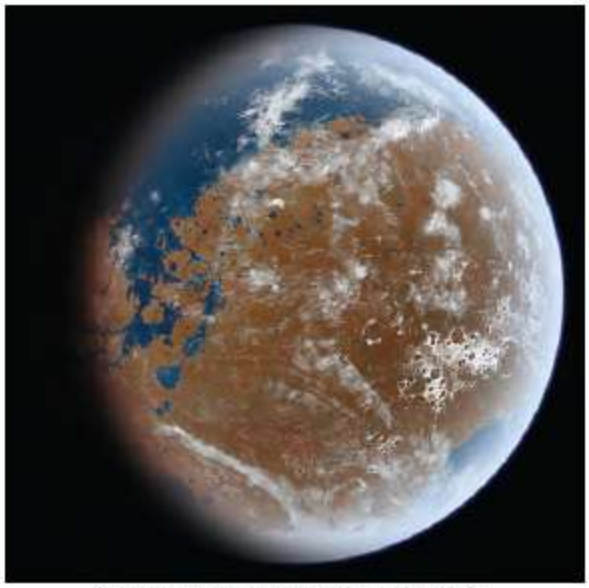
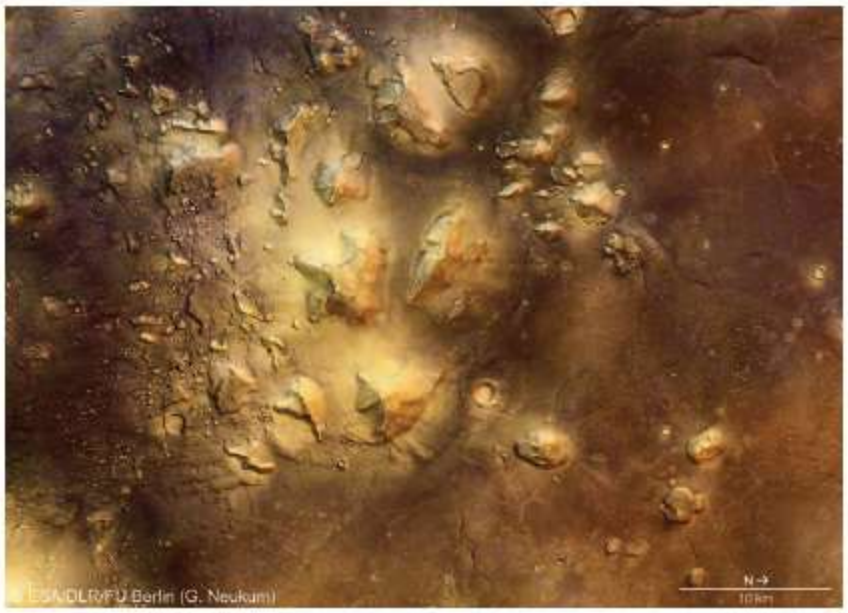
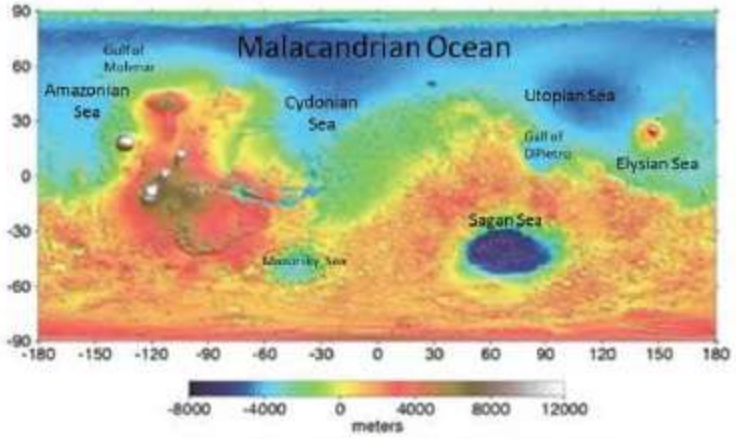


Painting of Mars with a Paleo-ocean by Ittiz.

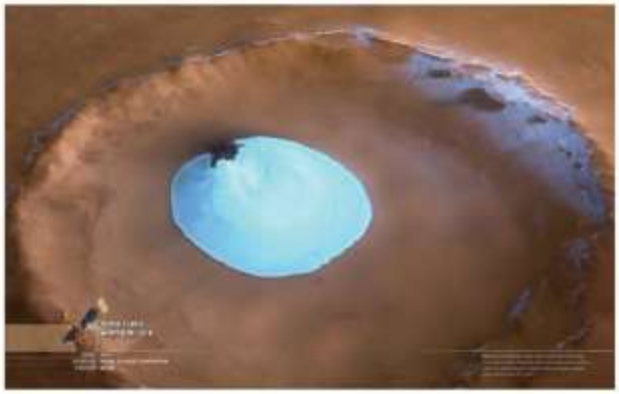
Castle Romeo Hydrogen Bomb Test.



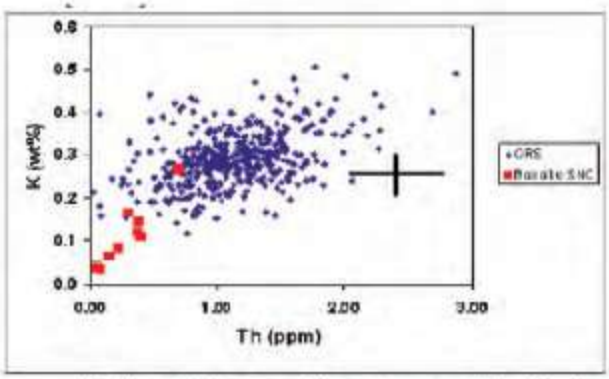
Cydonia Mensa imaged by Mars Express.



The Paleo-Ocean of Mars-elevation map showing the old ocean basin in blue. (NASA)

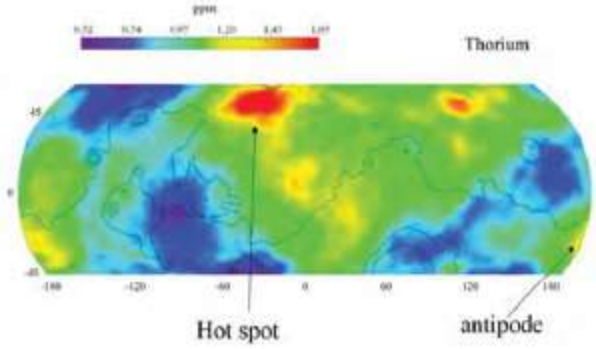


Frozen lake in a Martian crater. (NASA)

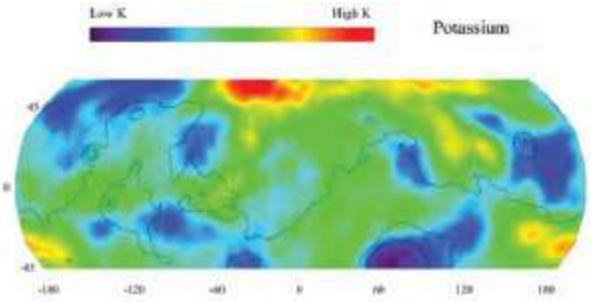


K, Th variations on Mars compared to Martian (SNC) basaltic meteorites. Typical statistical uncertainty shown on right.

Mars surface has much more radioactive Potassium and Thorium (GRS) than its meteorites. (NASA)

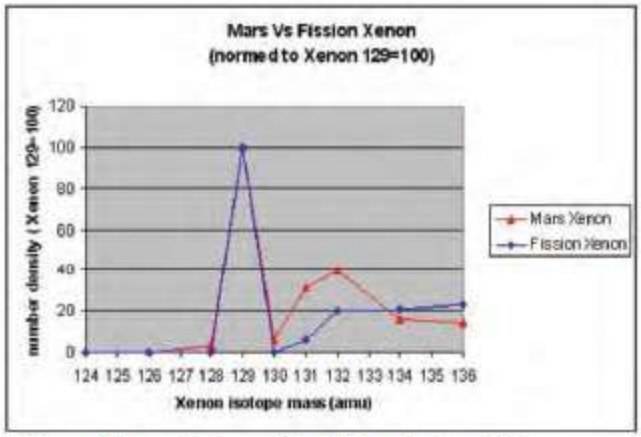


The Thorium of Mars. Note the hot spot at the antipode.

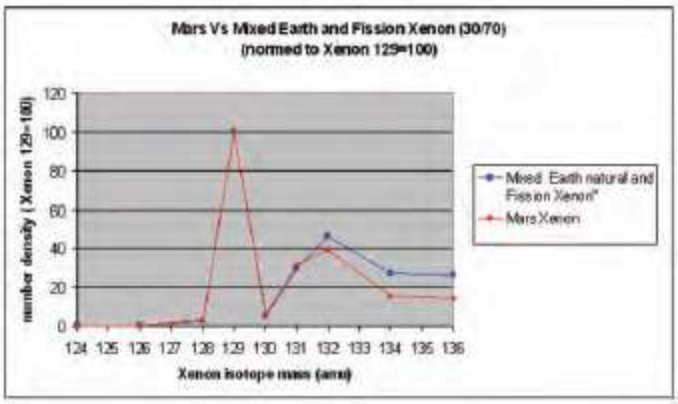


Map of radioactive Potassium on Mars. Note the same distribution as Thorium including the antipode.

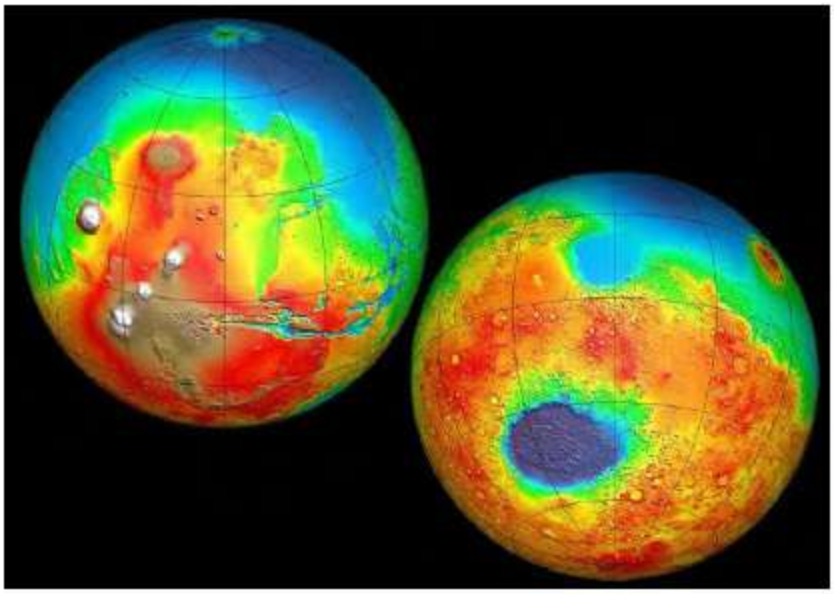
A curious group of rocks found on Mars by the NASA rover Curiosity, one resembling what looks like a large femur or other bone fragment.



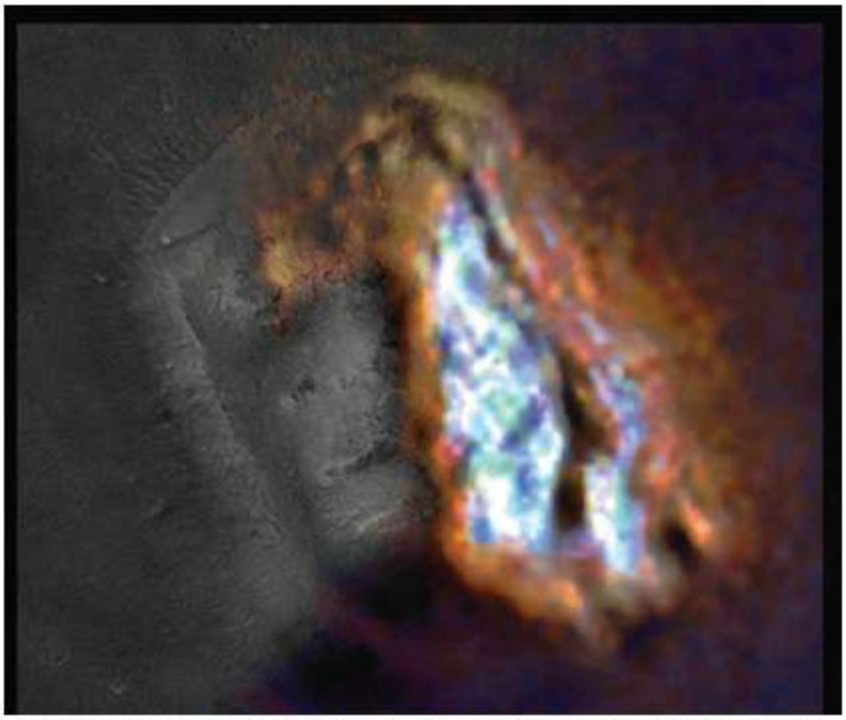
Mars and Human Fission produced Xenon Isotopes. (Data source JPL/NASA)



Mars and Human Fission produced Xenon Isotopes.

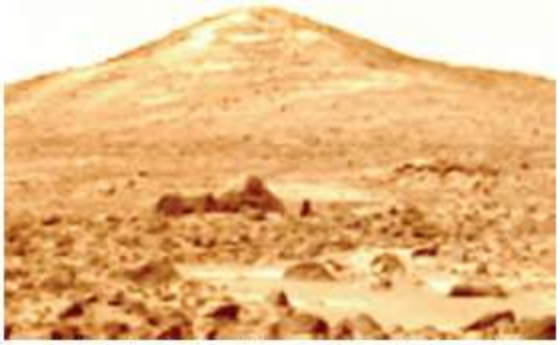


MOLA topography map of Mars showing cratered highlands (red) and cue ball smooth lowlands (blue) and the distinct "Line of Dichotomy" encircling the planet/moon. (NASA)

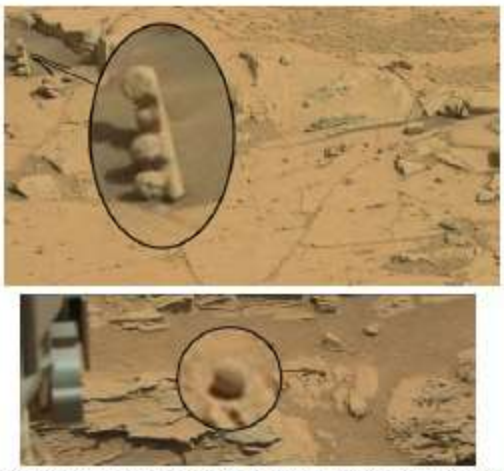


Composite image of the Face on Mars from Mars Global Surveyor and pre-dawn color image from Mars Odyssey showing underlying, reflective, mechanical/structural aspects of the Face. Image courtesy Richard C. Hoagland.

The hourglass-shaped crater in the Hellas Basin, Mars. (NASA)

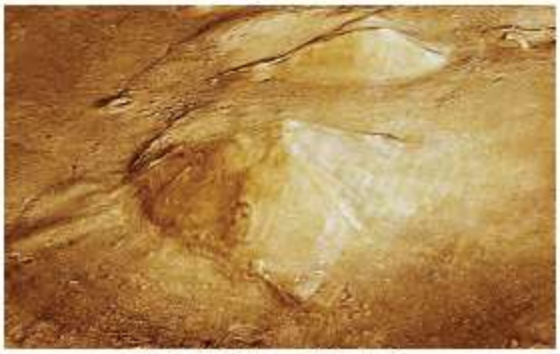


The Martian Sphinx with pyramid in the background.



More anomalous rocks found on Mars by the NASA rover Curiosity, one resembling a traffic light and another a perfect sphere. It seems odd for these shapes to occur in nature. (NASA)

The D & M Pyramid back side.



The D & M Pyramid front side.